

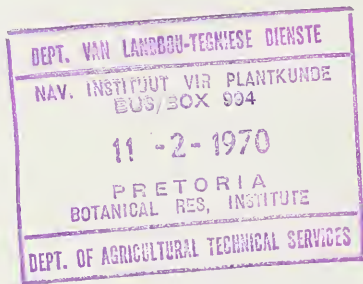
JOURNAL OF SOUTH AFRICAN
BOTANY

Supplementary Volume No. 7

**TAXONOMIC STUDIES ON
SOROCEPHALUS R.BR. AND
SPATALLA SALISB.**

J. P. ROURKE

Presented to the library by
Mr. J.P. Rouke October 1969

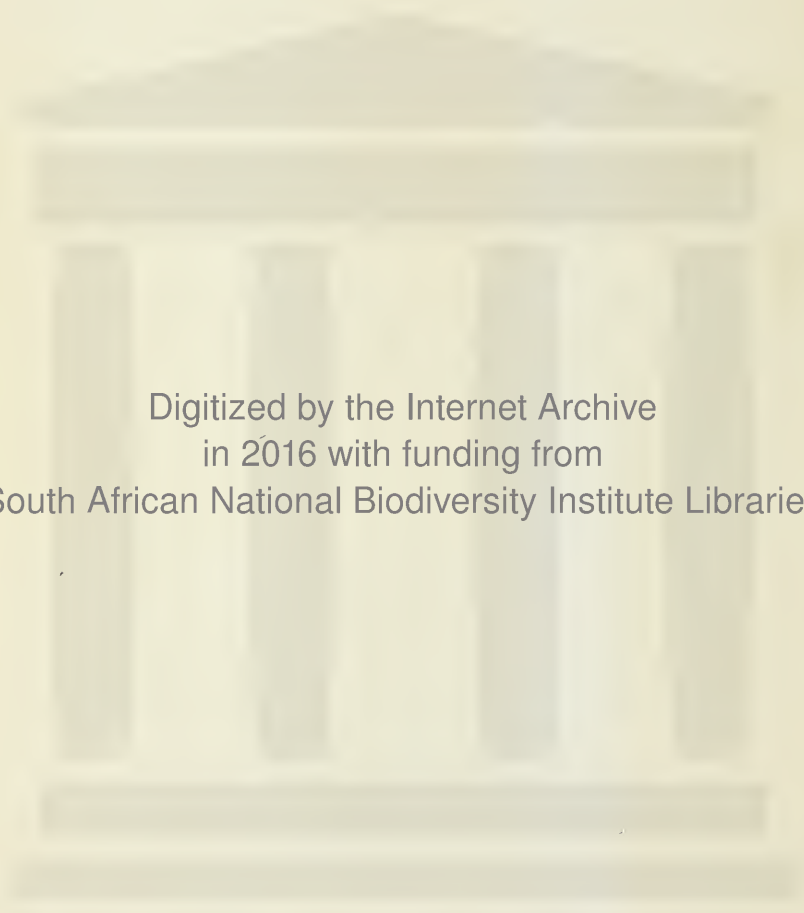


MARY GUNN LIBRARY



0000007111

South African National
Biodiversity Institute



Digitized by the Internet Archive
in 2016 with funding from
South African National Biodiversity Institute Libraries

<https://archive.org/details/botanysupplement07unse>

TAXONOMIC STUDIES ON
SOROCEPHALUS R.BR. AND
SPATALLA SALISB.



PLATE I.

Sorocephalus imbricatus (Thunb.) R.Br. A reproduction of plate 517 (pub. 1808) from H. C. Andrews *Botanist's Repository*. The plant illustrated had flowered in the collection of George Hibbert at Clapham, and was raised in 1802 from seeds collected by James Niven near the Tulbagh waterfall. It is described as "a tender plant and flowers at first sparingly which is the case with almost all this tribe in the first year or two". Since Hibbert's time no further attempts have been made to cultivate any of the species of *Sorocephalus* either in Britain or South Africa.

JOURNAL OF SOUTH AFRICAN BOTANY

*Published under the Authority of the Trustees of the
National Botanic Gardens of South Africa,
Kirstenbosch, Newlands, Cape Province*

Editor: H. B. Rycroft

Supplementary Volume No. 7

**TAXONOMIC STUDIES ON
SOROCEPHALUS R.BR. AND
SPATALLA SALISB.**

BY

J. P. ROURKE

M.Sc. F.L.S.

Compton Herbarium, Kirstenbosch

(With 10 Plates, 21 Figures and 33 Maps)

8th September, 1969

DEPARTEMENT VAN LANDBOU
CENTRALE BIBLIOTEEK (PRETORIA).

Steno. 582.639.2 Auteurs. 83535
Cat. Accession No. 83535

Geplaatst in dits kantoor van
Deposited in the office of

Navorsingsinstituut vir
Plantkunde

Datum/Ore 12 2 70

CENTRAL LIBRARY (PRETORIA)
DEPARTMENT OF AGRICULTURE

NAVORSINGSINSTITUUT VIR PLANTKUNDE
BIBLIOTEEK.

CATALOGUE NO. 1085

LIBRARY
BOTANICAL RESEARCH INSTITUTE

CONTENTS

	PAGE
Introductory remarks	1
Acknowledgements	1
Historical Review	2
Key to the Genera	5
Taxonomic characters	5
Interpretation of the inflorescences in <i>Sorocephalus</i> and <i>Spatalla</i> ..	10
Phytogeography	13
Revision of the genus <i>Sorocephalus</i>	21
Key to the species of <i>Sorocephalus</i>	22
(1) <i>S. pinifolius</i>	23
(2) <i>S. alopecurus</i>	24
(3) <i>S. clavigerus</i>	26
(4) <i>S. palustris</i>	31
(5) <i>S. crassifolius</i>	33
(6) <i>S. teretifolius</i>	36
(7) <i>S. imbricatus</i>	38
(8) <i>S. capitatus</i>	40
(9) <i>S. scabridus</i>	44
(10) <i>S. lanatus</i>	46
(11) <i>S. tenuifolius</i>	53
Revision of the genus <i>Spatalla</i>	57
Key to the species of <i>Spatalla</i>	58
(1) <i>S. tulbaghensis</i>	59
(2) <i>S. caudata</i>	62
(3) <i>S. confusa</i>	65
(4) <i>S. thyrsiflora</i>	68
(5) <i>S. incurva</i>	70
(6) <i>S. argentea</i>	74
(7) <i>S. propinqua</i>	77
(8) <i>S. salsoloides</i>	79
(9) <i>S. setacea</i>	83
(10) <i>S. nubicola</i>	86
(11) <i>S. parilis</i>	90
(12) <i>S. barbiger</i>	94
(13) <i>S. colorata</i>	96
(14) <i>S. prolifera</i>	99

(15) <i>S. squamata</i>	..	..	..	..	..	..	..	..	101
(16) <i>S. ericoides</i>	..	..	..	..	..	..	..	..	103
(17) <i>S. longifolia</i>	..	..	..	..	..	..	..	..	105
(18) <i>S. curvifolia</i>	..	..	..	..	..	..	..	..	108
(19) <i>S. racemosa</i>	..	..	..	..	..	..	..	..	114
(20) <i>S. mollis</i> ..	..	..	..	..	..	..	..	..	119
Species excluded	..	..	..	..	..	..	..	..	121
References ..	..	..	..	..	..	..	..	..	122

ABSTRACT

Taxonomic revisions of *Sorocephalus* (11 species) and *Spatalla* (20 species) have been undertaken. Three new species of *Sorocephalus* and two new species of *Spatalla* have been described. Keys to the species of both genera have been prepared and a distribution map is provided for each species. The genus *Spatallopsis* Phillips is considered synonymous with *Spatalla* and the criteria used for separating *Sorocephalus* and *Spatalla* are discussed. Morphological and phytogeographical evidence is advanced in support of the theory that species of *Spatalla* with one flowered involucre and racemose inflorescences represent the more advanced condition and could have been derived from an ancestral form with a paniculate inflorescence like *Sorocephalus*, by reduction in flower number and fusion of the bracteoles.

TAXONOMIC STUDIES ON SOROCEPHALUS AND SPATALLA

INTRODUCTORY REMARKS

When Phillips and Hutchinson revised the Proteaceae for the *Flora Capensis* in 1912, they were severely handicapped by the very poor material available at the time. This was particularly so in the case of *Sorocephalus* and *Spatalla*. Many species were known from types only and these were often so fragmentary that their dissection was precluded. It is quite clear that as a result of this dearth of material suitable for dissection, the structure of the inflorescences was never fully understood. Since the taxonomy of these groups was very confused, it was obvious that a complete revision encompassing *Sorocephalus*, *Spatalla* and *Spatallopsis* was necessary.

During the past few years numerous collecting expeditions have been undertaken to the more remote mountainous areas of the South Western Cape Province in order to make field observations, to obtain good material particularly in the fruiting stages, and to verify certain dubious distribution records. Consequently it has been possible to draw up descriptions from fresh material and to investigate the morphology and structure of the inflorescences from living specimens. Field studies and mass collections of a number of variable species have proved very useful.

ACKNOWLEDGEMENTS

The author wishes to express his sincere thanks to his supervisor, Prof. E. A. Schelpe, for his guidance and constructive criticisms, and the willingness with which he has discussed so many problems outside official working hours. I am particularly grateful to Prof. Schelpe and to the Keeper of Botany, British Museum (Natural History), for arranging to have certain type specimens photographed, which would otherwise have been inaccessible to me at the time. Much fresh material of rare and undescribed species has been supplied to me by Miss E. E. Esterhuysen of the Bolus herbarium, whose work as a collector in the South Western Cape is unparalleled in modern times. I acknowledge with gratitude the assistance she has given me in this connection.

While the bulk of the material used for this study is housed in the Bolus herbarium (BOL), the Compton herbarium (NBG), and the South African Museum herbarium (SAM), specimens have also been loaned by the directors of the following institutions who are sincerely thanked for their co-operation:

National Herbarium Pretoria (PRE).
Royal Botanic Gardens Kew (K).
Government Herbarium Stellenbosch (STE).
New York Botanic Gardens (NY).
Academy of Natural Sciences Philadelphia (PH).
Herbarium of the University of Cambridge (CGE).

The award of the Smuts Memorial Fellowship in Botany by the University of Cape Town, enabled me to make a careful study of type material at the British Museum (Natural History) (BM), the Thunberg herbarium in Uppsala (UPS), the Conservatoire Jardin Botanique, Geneva (G), the Museum National de Histoire Naturelle, Paris (P), and the herbarium of the Royal Botanic Gardens, Kew (K). I am greatly indebted to the University of Cape Town for making this overseas study possible and for permission to publish this paper, which is based on a thesis submitted to the University for the degree of Master of Science, June 1967. I also wish to thank Dr. R. Dahlgren for permitting me to use map blanks which he prepared for plotting distributions. The cost of publication was met by the Fourcade Bequest to the University of Cape Town.

HISTORICAL REVIEW

In the late seventeenth and early eighteenth centuries, travellers journeying eastwards from Cape Town, almost invariably passed Houw Hoek. It is here that we may expect them to have first encountered the genus *Spatalla*; almost certainly *S. racemosa*, which, through some unknown collector, found its way into Clifford's collection at Hartecamp and was described by Linnaeus in the *Hortus Cliffortianus* and later in the first edition of the *Species Plantarum*. Thunberg also crossed Houw Hoek and collected *S. racemosa*. Indeed, Thunberg was the first of the early botanists to make a significant contribution to our knowledge of both *Sorocephalus* and *Spatalla*. By the time Thunberg had published his "*Dissertatio de Protea*" in 1781, he had already collected four species of *Spatalla*, three of them being newly described and figured by him, and two species of *Sorocephalus* which were also figured by him in the same publication.

After Thunberg, collectors such as Dr. William Roxburgh, Francis Masson and James Niven contributed further material of these two genera to the herbaria of Europe. Of them, the most notable was James Niven, who was a gardener to George Hibbert of Clapham and collected in South Africa for Hibbert between the years 1798 and 1803. To a large extent the succeeding monographs of both Brown and Salisbury were based on Niven's material, which was always provided with accurate details of the locality, time of flowering and frequently with ecological information.

THE RECOGNITION OF DIFFERENT GENERA

Apart from *Brabeium*, Thunberg had placed all the South African Proteaceae in one genus, namely, *Protea*. Salisbury, however, realised the heterogeneity of Thunberg's concept of *Protea* and proposed its division into ten different genera, in the *Paradisus Londinensis* in 1807 (opp. tab. 67). One of Salisbury's new genera was *Spatalla*.

Shortly after this there followed two major works dealing with the taxonomy of the Proteaceae in which there was a conflict, not only between the specific, but also the generic names. Probably the best known of these was Robert Brown's classical paper "On the Proteaceae of Jussieu" which was read to the Linnean Society on the 17th of January 1809. This paper was only published early in 1810, by which time R. A. Salisbury, writing under the name of Joseph Knight (Hibbert's gardener), had published his book "*On the Cultivation of the Plants Belonging to the Natural Order Protæeae*". From this point it is necessary to consider the histories of the genera under consideration, separately.

Sorocephalus:

Brown enumerated eight species in his genus *Sorocephalus* while Salisbury listed seven which he placed in *Sorranthe*, both of these genera having been newly established by their respective authors. Brown's circumscription of *Sorocephalus* was much wider than that which has been adopted in the present revision, for I have found it necessary to transfer to *Spatalla* three species which he had described under *Sorocephalus*.

The sectional division of *Sorocephalus*, as proposed by Endlicher (1837), was followed by Meisner. Meisner (1856), also had a very confused concept of the genus since he included a *Spatalla*, a *Paranomus* and a *Leucadendron* under *Sorocephalus*, all of which he succeeded in placing in one or the other of Endlicher's two groups.

There were no further revisions of the genus or additions to it, until Phillips and Hutchinson (1912) produced their revision of the South African Proteaceae for the *Flora Capensis*. In this work thirteen species were recognised, of which two were described as new, but have both been reduced to synonymy in the present revision. It is quite obvious that there had been little further collecting since Drège had visited the Cape and these authors had virtually the same material at their disposal as Meisner had had, over fifty years before. Consequently, it is not surprising that their account of *Sorocephalus* was very incomplete, due largely to the paucity of material. Phillips (1912) had even stated that ten out of the thirteen species were known from type specimens only and these were chiefly of Niven's collecting. Even to-day the situation leaves much to be desired and there are numerous large gaps in our knowledge of *Sorocephalus*.

Spatalla:

After having established *Spatalla* in 1807, Salisbury altered his original concept of the genus [which had included *Sorocephalus lanatus* (Thunb.) R.Br.], when he published the first major account of *Spatalla* in 1809. Salisbury listed twelve species, including eight new taxa which had been collected at the Cape by James Niven and John Roxburgh. Three conveniently diagnostic groups were established. The following year Brown described fifteen species of which eleven were new. Although Brown recognised two sections containing species with three and one flowered involucre respectively, he did not give names to these sections. These two sections were later to be recognised by Endlicher (1837) and have been used in the present revision. Meisner (1856) closely followed both Brown and Endlicher, describing two additional species himself.

THE POSITION OF SPATALLOPSIS

No further work was published on this group until Phillips (1910) established a new genus, *Spatallopsis* Phillips, to accommodate five species described as having "a regular calyx and a conical stigma". Two years later in his description of this genus in the *Flora Capensis* he states that the perianth is "straight and cylindric in bud" (Phillips 1912). It is difficult to understand how such an observation could ever have been made, for an examination of some of the syntypes of *Spatallopsis* shows that the perianth is distinctly curved in bud, showing weak zygomorphy. In addition, the conical pollen presenter and the subterminal region of the style are curved abaxially. There is a complete range of pollen presenter types in the species of *Spatalla* with three flowered involucres, from obliquely conical through obliquely obovoid to an obliquely obovate cochleariform disc. This graded series of pollen presenter types is accompanied by changes in the perianth, ranging from species in which the four perianth segments are of uniform shape and size, through species having an enlarged posticous segment, to species in which the posticous perianth segment is enlarged, erect and galeate. It is quite impossible to satisfactorily divide a graded series such as this, as Phillips attempted to do. There seems no doubt that the characters used for distinguishing *Spatallopsis* from *Spatalla* were based on faulty observations, probably as a result of the very inadequate material available at the time. Therefore, the genus *Spatallopsis* Phillips, is reduced to synonymy and the species formerly placed therein are returned to *Spatalla* in which genus most were originally described. Within the two above-mentioned genera, twenty six taxa were recognised in the *Flora Capensis*. In the present revision only twenty (including two new species) are upheld in a single genus, *Spatalla*.

It might be argued that the very constant difference in the number of flowers per involucre between the two sections of *Spatalla*, is sufficient evidence to

accord generic status to both sections. However, this would require the weighting of a single character against the sum of all the morphological similarities of leaves, perianth, pollen-presenter and fruits that are common to both sections. I can find no justification for taking this step.

KEY TO THE GENERA

- 1 Involucres 4 to 9 flowered, perianth straight in bud, style and pollen presenter straight, cylindric, ellipsoid or capitate; fruits usually glabrous and emarginate at the base (rarely pubescent with a truncate and pedicellate base); inflorescence globose *Sorocephalus*.
- 1 Involucres 3 or 1 flowered, perianth curved abaxially in bud, usually zygomorphic, style apex curved abaxially, pollen presenter oblique, conical, obovoid, or an obliquely obovoid cochleariform disc; fruits always truncate and pedicellate at the base, pubescent; inflorescence usually cylindric *Spatalla*.

TAXONOMIC CHARACTERS

(1) *Leaves*.

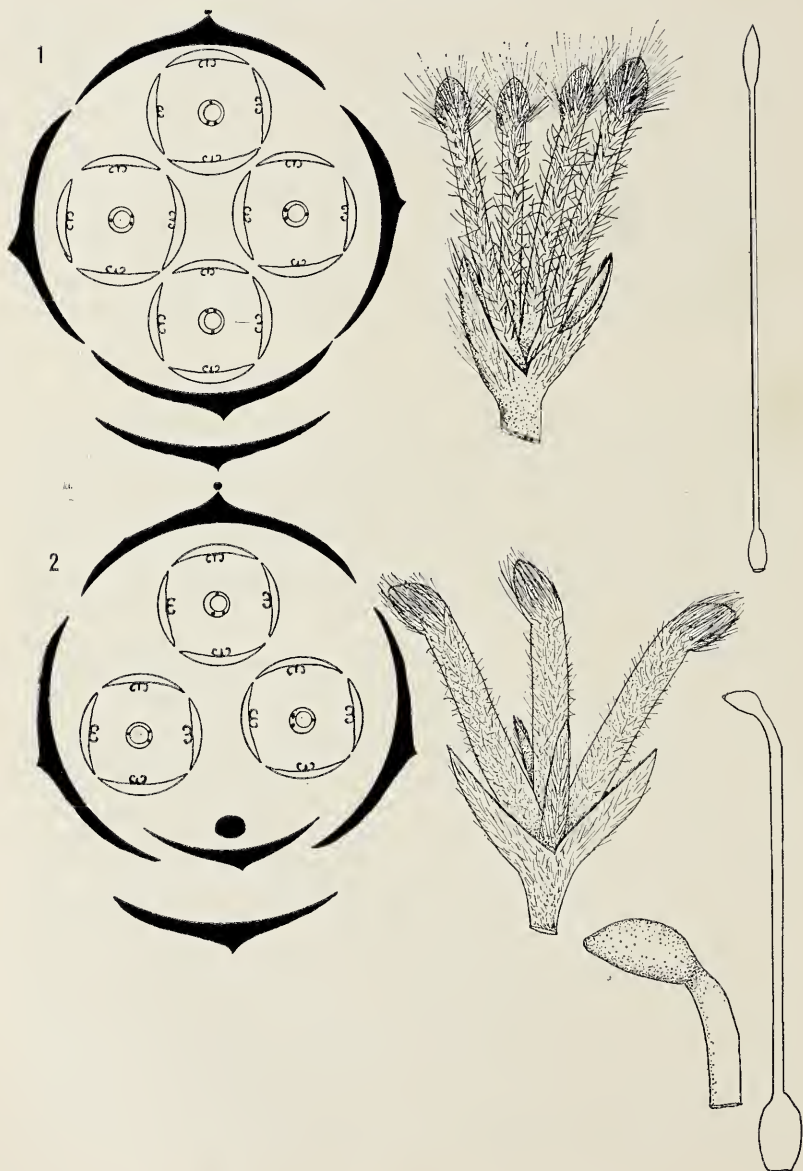
In differentiating species of *Sorocephalus* and *Spatalla*, the leaves can provide valuable characters. Superficially they all appear to be similar but on close examination they are clearly of three kinds; absolutely terete, acicular terete with a canaliculate upper surface, or linear and semi-terete with a flattish to concave upper surface. These differences in leaf morphology are constant and are very useful in grouping species into sections. In nearly all the species of both genera the leaves are mucronate but a few species of *Spatalla* have a rounded, blunt leaf apex.

The leaves are pubescent at first in most species, becoming glabrous with age, but in *Spatalla argentea* and *S. barbigera* the leaves retain their dense sericeous indumentum.

Leaf curvature has been used previously to distinguish species but this can vary considerably among individuals within a single population and is not regarded as a reliable taxonomic character.

(2) *Involucres*.

The inflorescence of *Sorocephalus* is a globose panicle consisting of a main axis from which a number of lateral racemes arise. These lateral racemes contain from 4 to 9 flowers, clustered together, each subtended by a bracteole, and were originally termed "involucres" by Brown (1810) whose terminology is adopted here. In *Spatalla* the inflorescence is usually cylindrical and the involucres are 3 or 1 flowered and appear to have been derived from a four flowered involucre such as occurs in *Sorocephalus* by reduction and concomitant fusion of the bracteoles. The number of flowers per involucre is of considerable diagnostic value at both generic and specific level. In the present revision, flower number per involucre is one of the principal criteria used for separating *Sorocephalus* and *Spatalla*. (See Fig. 1).



(3) *Bud curvature and zygomorphy.*

As far back as 1810, Robert Brown had already realised the usefulness of the degree of bud curvature and zygomorphy in generic and specific delimitations in the Proteaceae. Referring to the style he remarks, "its obliquity is of greater importance than its form; for this, when existing in any great degree, is generally accompanied with a corresponding irregularity in the calyx". With regard to the curvature of the bud he claims to "have derived the greatest advantage in some difficult genera, especially *Serruria*, from attending to its differences in direction". (Brown 1810.) Although differences in the degree of bud curvature and zygomorphy are not always obvious in poorly prepared herbarium material, too little attention has since been paid to this useful character. The change in the symmetry of the perianth from actinomorphy in *Sorocephalus* to zygomorphy in *Spatalla* has been found to be very useful in separating these two genera.

(4) *Pollen presenter.*

The authors of the *Flora Capensis* used the term stigma when describing the terminal region of the style in the Proteaceae. This is incorrect as the organ in question is not a stigma but the swollen style apex which is often highly specialised and may be elaborated into a great variety of forms. The actual stigmatic surface is situated in a minute groove which terminates the swollen style apex, or is placed obliquely on it. Bentham (1873), first drew attention to this peculiar structure in relation to the pollination of the Australian Proteaceae, referring to it as the "style end".

The term "pollen presenter" was proposed by Guthrie and Salter (1950). The anthers discharge the pollen onto the style apex before the perianth segments have separated. Thus shortly after anthesis, the pollen mass clings to the style apex or "pollen presenter", until it is removed by a pollinating agent or by wind. (See Plate 5.) Thus the term "pollen presenter" is very appropriate for a rather specialised portion of the style, which due to its many forms is of great diagnostic value, particularly at specific level. (See Fig. 2.)

(5) *Fruits.*

Fruits when available have been found to be of considerable value in identification among many groups of the South African Proteaceae. Two distinguishable types of fruits are produced by species of *Sorocephalus* and *Spatalla*.

FIG. 1: Diagrammatic representation of the principal differences in inflorescence structure and floral morphology between *Sorocephalus* and *Spatalla* sect. *Cyrtostigma*. (1) *Sorocephalus* with a four flowered involucre; perianth straight in bud, style and pollen presenter straight. (2) *Spatalla* sect. *Cyrtostigma* with three flowered involucre; perianth curved abaxially in bud, style apex curved abaxially, pollen presenter oblique. In the inflorescence diagrams the axis of the inflorescence is marked by a dot.

In one group the fruits are hairy and are also truncate and pedicellate at the base. In the other group the fruits are glabrous and emarginate at the base instead of truncate. Hairy fruits which are truncate and pedicellate at the base

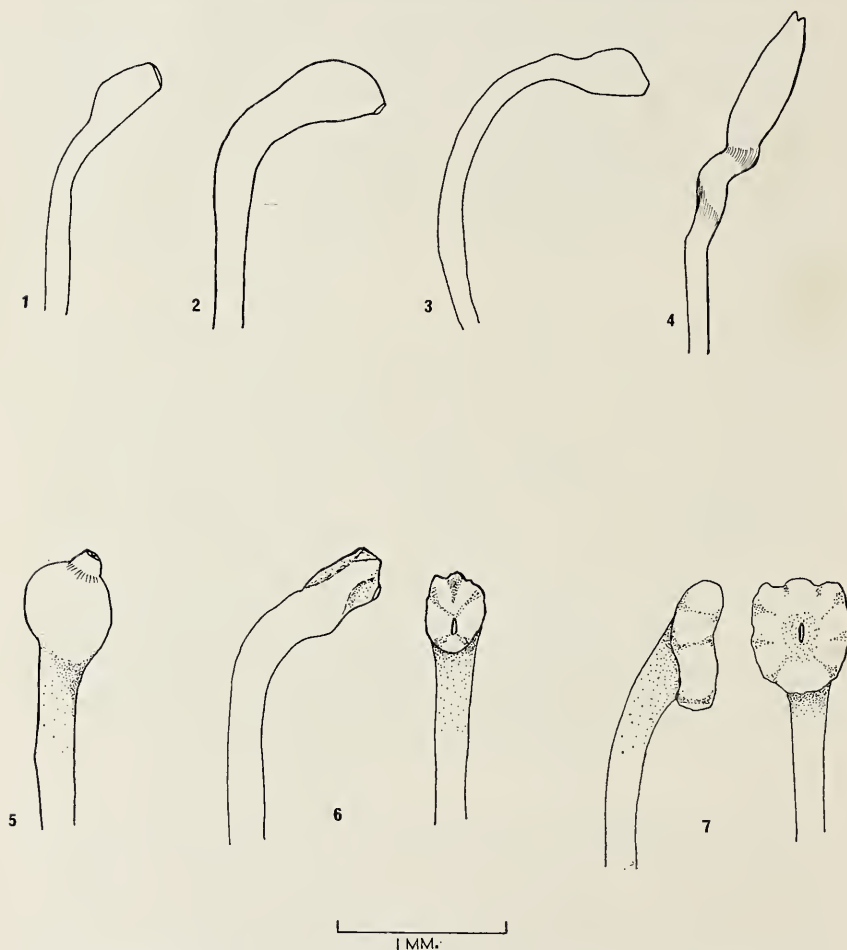


FIG. 2: Different types of pollen presenter in *Spatalla*. (1) *S. tulbaghensis* (2) *S. caudata* and *S. confusa* (3) *S. thyrsiflora* (4) *S. salsoloides* (5) *S. nubicola* (6) *Spatalla incurva*, lateral and anterior view (7) *S. argentea*, lateral and anterior view.

are produced by all species of *Spatalla* and one species of *Sorocephalus* (*S. tenuifolius*). Fruits which are glabrous and emarginate at the base are produced only by *Sorocephalus*. (See Figs. 3, 4 and 8.)

1 mm.

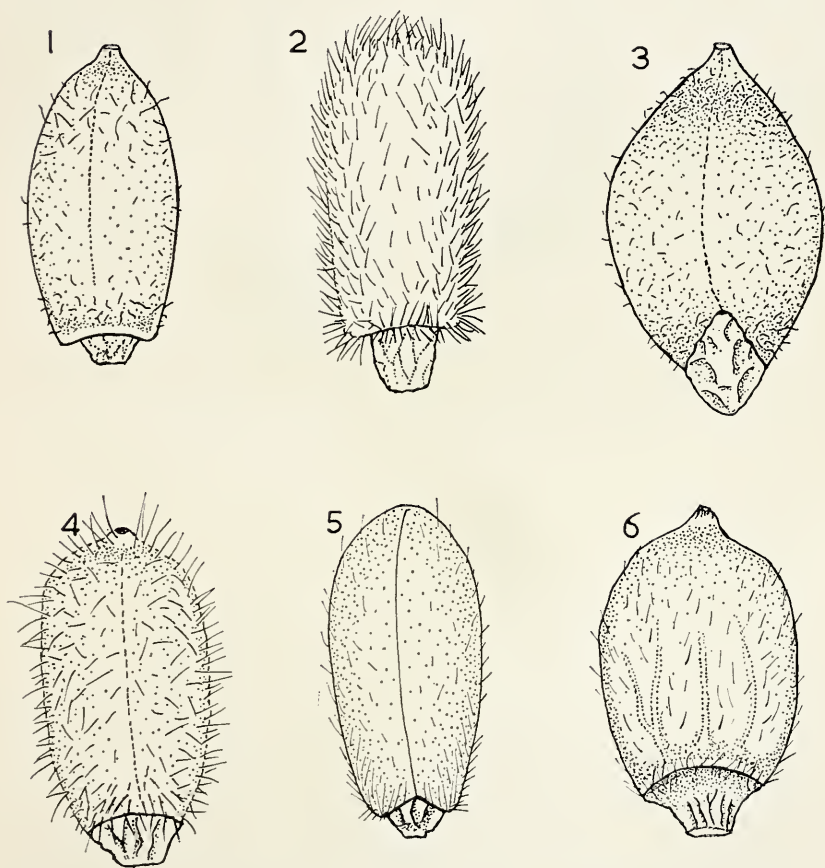


FIG. 3: Fruits of various species of *Spatalla* showing the range of different forms. (1) *S. squamata* and *S. ericoides* (2) *S. longifolia* (3) *S. setacea* (4) *S. colorata* and *S. parilis* (5) *S. prolifera* (6) *S. salsoloides*.

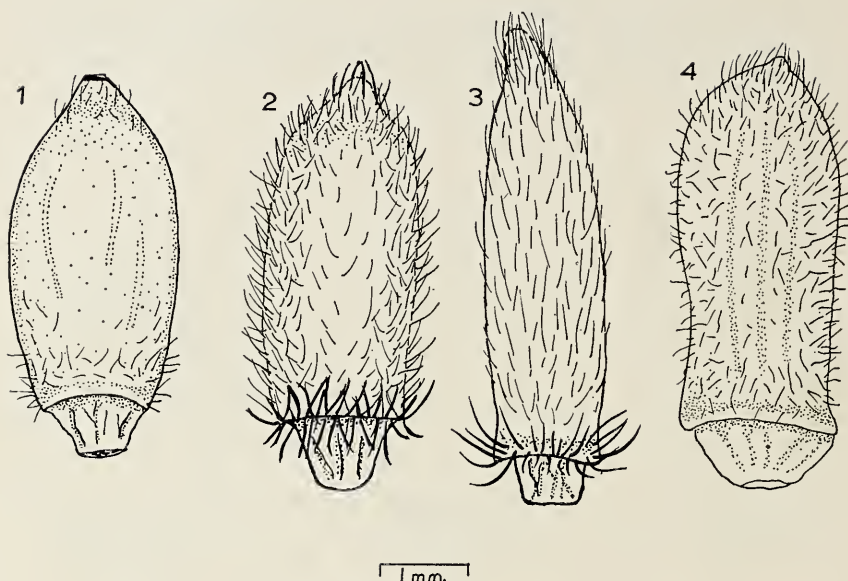


FIG. 4: Further types of fruit in *Spatalla*. (1) *S. propinqua* (2) *S. incurva* (3) *S. racemosa* (4) *S. argentea*.

INTERPRETATION OF THE INFLORESCENCES IN *SOROCEPHALUS* AND *SPATALLA*

Among the inflorescences produced by species of these two genera, a series of stages can be traced from a paniculate inflorescence with four flowered involucre to a racemose inflorescence with one flowered involucre. It was noted that in species of *Spatalla* with three flowered involucre, the 4th or anticous bracteole, often subtends a mound of undifferentiated tissue. This leads one to suspect that it could be interpreted as the remains of a reduced flower, as it has on one occasion been found to be represented by a perfect flower (in *S. thyrisflora*). In those species in which the involucre are one flowered (*Spatalla* sect. *Spatalla*), there are no mounds of tissue associated with the four bracteoles which surround the single flower. Serial sections of the involucre were cut in order to determine the orientation of the flower in relation to a particular bracteole and to search for any evidence of superfluous traces which might indicate the position of a reduced organ.

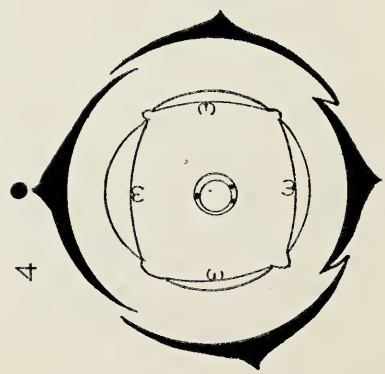
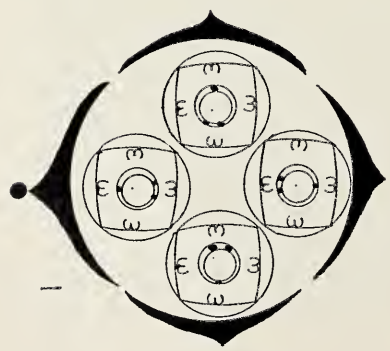
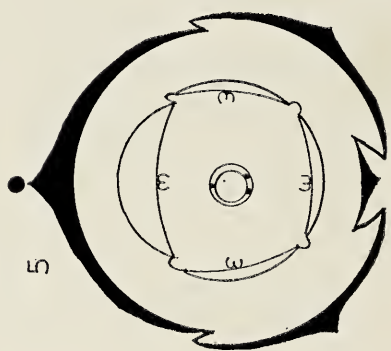
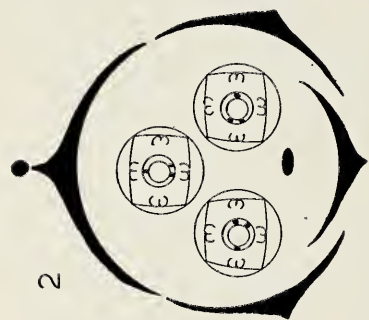
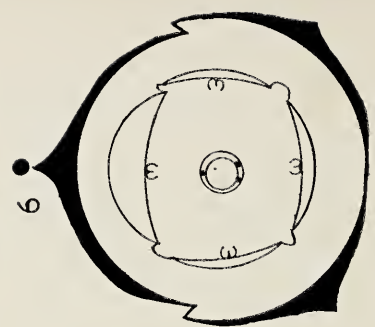
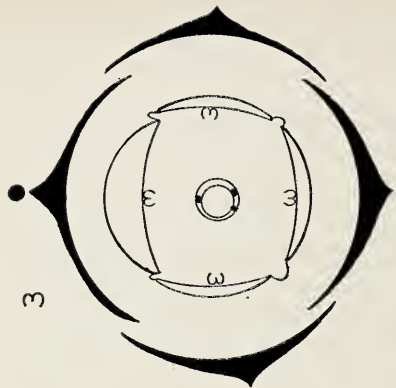
Methods.

Morphological studies of the inflorescence were based entirely on fresh material. Detailed floral anatomical studies were carried out on *Sorocephalus lanatus* (the form with 4 flowered involucre), *Spatalla confusa*, *S. incurva*, and *S. curvifolia*. Material of these species was collected in the field, fixed in F.A.A., dehydrated through various grades of ethyl alcohol and finally embedded in paraffin wax. Serial sections were cut at 10μ on a rotary microtome and stained with Fast Green and Safranin. This stain combination was found to show the details of the vascular system satisfactorily.

The relationship between flower and bracteole in each involucre can be determined by reference to the carpellary traces. The ovary is monocarpellary and is supplied by three vascular traces, one dorsal and two ventrals. The dorsal vascular trace is always adjacent to the subtending bracteole, and the two ventrals face the pedicel of the involucre.

The carpels of the four flowered involucre of *Sorocephalus lanatus* are arranged at right angles to each other. (Fig. 5, 1.) From the orientation of the carpels in the three flowered involucre of *Spatalla incurva* it can be seen that the anticous flower is absent (Fig. 5, 2, Fig. 6). *Spatalla curvifolia* was taken as an example of a species with one flowered involucre. In this species the dorsal carpellary trace is adjacent to the posticus bracteole, that is the upper lip of the involucre. The lower lip of the involucre is trifid and is composed of three fused bracteoles. Seven vascular traces supply the lower lip of the involucre, three to each of the lateral bracteoles and a large median trace supplies the small median bracteole. This large median vascular strand probably represents three fused traces. (Fig. 6.)

In the series traced from four to one flowered involucre, it is apparent that fusion of the bracteoles accompanies a reduction in the number of flowers (Fig. 5, 1—6). From the position of the carpellary traces it seems probable that the one flowered involucre have arisen by reduction of the three most anterior flowers, and the single flower remaining is that subtended by the posticus bracteole. Amongst those species with one flowered involucre there is variation in the degree of fusion of their bracteoles. From the free condition in *Spatalla parilis* (Fig. 5, 3), a series of stages can be traced showing increasing fusion of the bracteoles. *Spatalla barbiger* represents the stage of partial fusion (Fig. 5, 4) and in *S. curvifolia* (Fig. 5, 5) the bracteoles are almost completely fused. It can be argued that the three bracteole condition in *S. mollis* (Fig. 5, 6) is the result of the reduction and eventual disappearance of the anticous bracteole. If fusion and reduction can be regarded as being indicative of phylogenetic advancement in this group of plants, it is reasonable to regard the species with four to nine flowered involucre (*Sorocephalus*) as indicating the primitive condition, and the species with one flowered involucre as indicating the advanced condition.



This phylogenetic series is further associated with zygomorphy, abaxial curvature of the perianth and increasing complexity of the pollen presenter. It would seem that the apparently simple racemose inflorescence in *Spatalla* sect. *Spatalla* is in fact an inflorescence in an advanced state of reduction, and has probably been derived from a paniculate type such as is seen in *Sorocephalus* by reduction in flower number with concomitant fusion of the bracteoles and zygomorphy. Similar trends were noted by Haber (1959, 1966), who, after an extensive investigation of the anatomy and morphology of the Australian, South American and South African Proteaceae, concluded that the racemose inflorescences of many taxa are highly reduced and have been derived from a paniculate type of inflorescence.

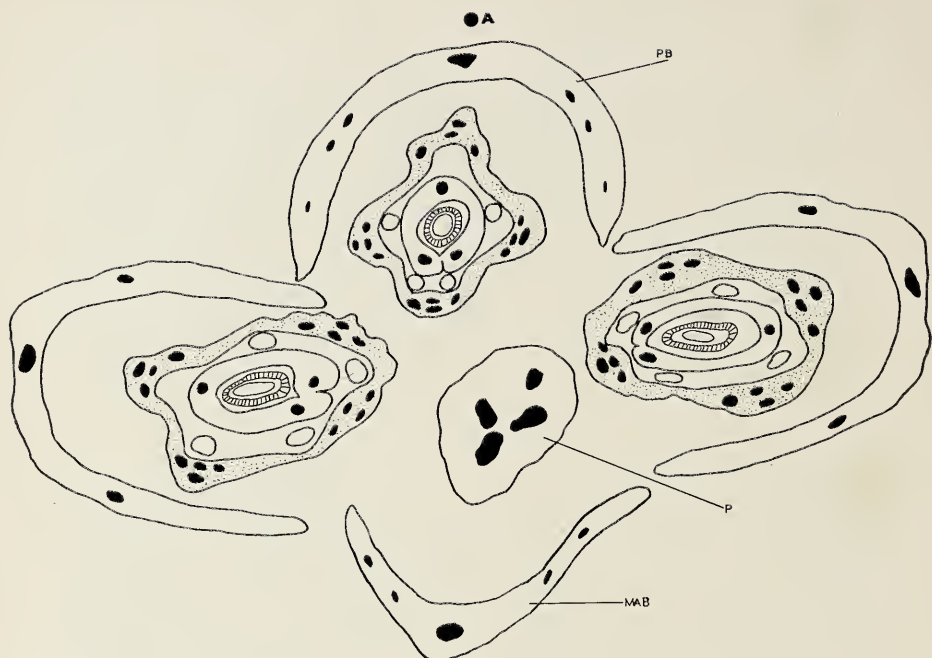
PHYTOGEOGRAPHY

(1) *Sorocephalus*.

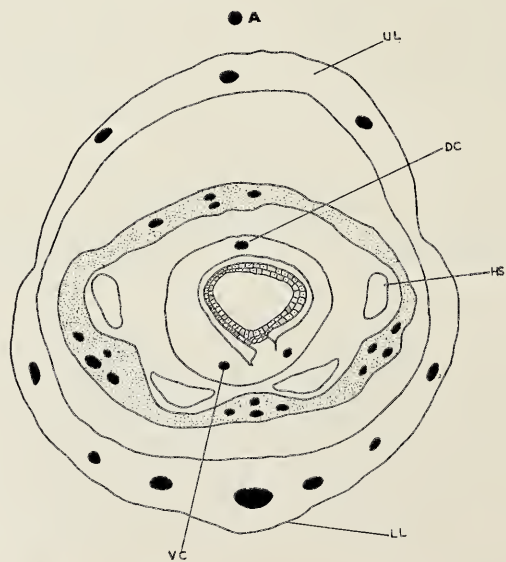
The genus *Sorocephalus* is endemic to the South Western Cape Province, extending from the Cedarberg in the north to the Kogelberg and Klein River mountains in the south and the Riversonderend range in the east. It is distributed along the length of the main chain of Table Mountain sandstone ranges in the South Western Cape. Two features of the distribution of *Sorocephalus* are notable. They are, firstly, the tendency of the majority of known species to occur at relatively high altitudes, and secondly, the very restricted and localised distribution of seven of the taxa. *Sorocephalus* can be considered as a component of the Cape sub-alpine vegetation, occurring mostly at 4,000—6,000 ft., with only two species extending below 3,000 ft. Most species are found on or around the summits of the higher Cape peaks, often being confined to the summit of a single peak. Only *S. clavigerus* and *S. lanatus* have reasonably "wide" distributions.

Three sections can be distinguished within the genus, based on leaf and fruit characters. Two of these sections, *Mischocaryon* and *Sorocephalus* occupy definite geographical areas and do not overlap, being separated by a distinct disjunction, described as the Tulbagh interval by Wiemarck (1941). Species of

FIG. 5: Inflorescence diagrams of *Sorocephalus* (1) and *Spatalla* (2—6) showing the reduction in flower numbers in each involucre and the progressive fusion of the bracteoles. The inflorescence axis is marked by a dot. (1) *Sorocephalus lanatus*, a four flowered involucre. The carpels are arranged at right angles to each other. (2) *Spatalla incurva*. The involucre is three flowered with the abortive anticus flower being represented by a small stump of tissue. (3) *Spatalla parilis*. The involucre is now one flowered but the four bracteoles are still present, equally developed and free. (4) *Spatalla barbigera*. The involucre is now bilabiate with the posticus bracteole free and the three anticus bracteoles partially fused. (5) *Spatalla curvifolia*. The median anticus bracteole has been greatly reduced in size. The three anticus bracteoles are now fused for the greater part of their length. (6) *Spatalla mollis*. The median anticus bracteole has now disappeared leaving the two lateral bracteoles which have become fused to the posticus bracteole.



2



the section *Sorocephalus* occur in Weimarck's north western centre, and are found on the Cedarberg, Cold Bokkeveld, Ceres and Tulbagh mountains. The section *Mischocaryon* is confined to the Weimarck's south western centre, the species occurring on the Du Toits Kloof, Hottentots Holland, Kogelberg, Klein River and Riversonderend mountains. (Fig. 8.) *Sorocephalus tenuifolius*, is the only species belonging to the section *Dasyacaryon* and has been recorded from the south western centre, from the Kogelberg to Elim.

Field observations have shown that those species which are endemic to the summit of a single peak, are rare, with only a few plants surviving. Very few viable seeds appear to be produced and little or no regeneration of seedlings has been observed. Species of this sort in the Cape Flora have been referred to as relicts by Weimarck (1941).

At least one species, *S. lanatus*, exhibits topoclinal variation as a series of poorly differentiated local races, localised on the summits of high peaks, from the Cedarberg to Ceres. In view of this phenomenon, it is reasonable to assume that this may have happened in the past to older species which through subsequent long standing isolation have given rise to the vicarious modern species in both main centres. Söhne, Visser, and van Riet Lowe (1937), have produced evidence that there have been fluctuations in the climate of Southern Africa during the Quaternary with alternating arid and pluvial periods. During the Upper Pleistocene at least one pluvial or hypothermal phase has been recognised when lower temperatures and a higher humidity prevailed. (van Zinderen Bakker, 1962.) Moreover, it is thought that such conditions could also have occurred during the Lower Pleistocene. Whatever the extent and duration of these fluctuations might have been, it seems certain that under conditions of climatic change such as those which occurred during the Quaternary, the dissected topography of the South Western Cape would have caused the isolation of plant populations, particularly of montane taxa. It is possible that these processes have played an important role in the speciation and distribution of *Sorocephalus*.

FIG. 6: Transverse sections of the three flowered involucre of *Spatalla incurva* (1) and the one flowered involucre of *S. curvifolia* (2) at the level of the ovary. The perianth is stippled. Each perianth segment is vascularised by 4 traces. The 4 hypogynous scales (HS) alternate with the perianth segments. The dot (A) represents the inflorescence axis. In *S. incurva* compare the orientation of the carpellary traces of the flower subtended by the posticous bracteole (PB), with those in the single flower of *S. curvifolia* (2). In *S. curvifolia* the single posticous bracteole forming the upper lip of the involucre, subtends the flower as can be seen from the orientation of the dorsal carpellary trace (DC) and the 2 ventral carpellary traces (VC). The lower lip of the involucre is vascularised by 7 traces with a single large median trace supplying the median bracteole and three traces on either side supplying the two lateral bracteoles.



FIG. 7: Involucres of *Spatalla* (perianth removed), viewed from the anticous position, to show variation in form and also the progressive fusion of the bracteoles and concomitant reduction in size of the anticous bracteole until it disappears in *S. mollis*. (1) *S. parillis*; (2) *S. colorata*; (3) *S. barbiger*; (4) *S. squamata*; (5) *S. ericoides*; (6) *S. mollis*. (all $\times 14$).

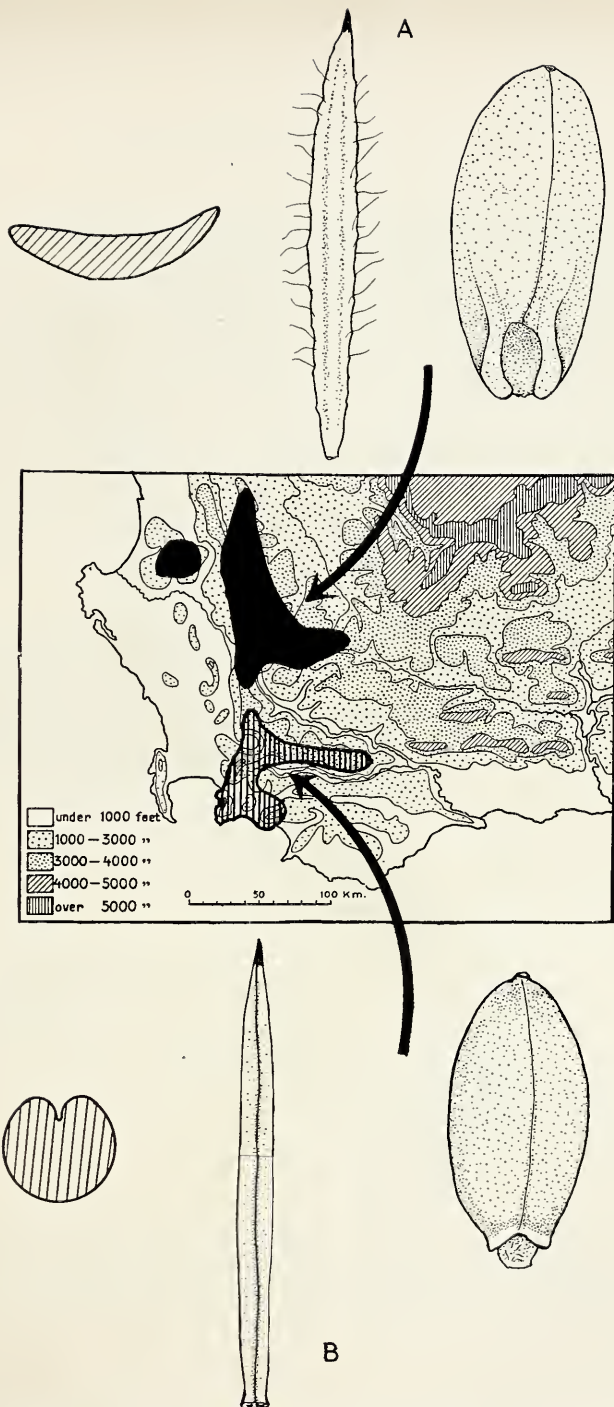


FIG. 8: Distribution of the two main sections of *Sorocephalus*. (A) Sect. *Sorocephalus* (blackened area), in the North Western centre, with flat or semi-terete leaves and glabrous fruits, narrowly emarginate at the base. (B) Sect. *Mischoacaryon* (hatched area), in the South Western centre, with acicular terete leaves, canaliculate on the upper surface, and glabrous fruits, broadly emarginate and pedicellate at the base.

(2) *Spatalla*.

In the present revision twenty species of *Spatalla* are recognised, and all are confined to the South Western and Southern Cape Province. Most of the species have rather small distribution ranges, but one, *S. confusa*, extends from the Cedarberg in the north as far east as the Kamanassie mountains (Uniondale), and in this respect it is quite exceptional. *Spatalla* has a distribution characteristic of many Cape genera, that is, with a high proportion of the species concentrated in the south west particularly the Caledon district (Levyns 1954; Dahlgren 1963).

More than half (eleven species) of the total number of species are endemic to the south western centre. Within the Kogelberg reserve alone, five species are known to occur and there are six on the Riversonderend range. Compared with the species density of the south western centre, the north western centre which is twice the area, is low, with only 4 species. To the eastward, mountain bridges are formed by the Langeberg and the Swartberg. Of the four species



Map 1. Distribution of the genus *Spatalla* showing the species density. The blackened area contains 11 species, the darkly hatched area 6 species and widely hatched area less than 6 species.



Map 2. Distribution of the genus *Spatalla*, showing the range of the two sections of the genus. The blackened area represents *Spatalla* sect. *Cyrtostigma* and the hatched area represents *Spatalla* sect. *Spatalla*.

occurring on the Langeberg—Outeniqua range, three are found on Lemoenshoek peak which is an important centre on this range. Adjacent and parallel to the Langeberg is the Swartberg with two species. (Map 1.)

A study of the two sections within the genus shows that in their distribution, they occupy definite areas. Section *Cyrtostigma* is mainly confined to the high mountains of Weimarck's north western centre and the Swartberg. Section *Spatalla* is represented only in the south western centre and on the Langeberg, with four species extending south into the Bredasdorp district. (Map 2.)

(3) *Comparison of the Distributions of the Two Genera.*

When considering the phytogeography of a group of plants, it is useful to relate their present observed distributions to the climatic and geological changes which have taken place in the past. At the Cape it is known that the mountain ranges now occupied by the Cape Flora were in existence by the end of the

Triassic. Moreover, the low lying land of the Malmesbury and Bredasdorp districts was subjected to several marine encroachments and recessions during the Pleistocene and hence the land surface of these low lying areas is of fairly recent origin (Du Toit 1966). This is of some significance since it is generally recognised that one of the conditions promoting rapid evolution is "the opening up of new environments" (Stebbins 1951).

The suggestion has been made elsewhere that on morphological grounds species of *Spatalla* with one flowered involucre might be regarded as advanced, and could have been derived from a form like *Sorocephalus* through an intermediate stage resembling *Spatalla* sect. *Cyrtostigma*. Species of the morphologically more primitive type such as *Sorocephalus*, have been shown to be very local in their distribution, with a low degree of seed viability, and are considered to be relicts now facing extinction. *Spatalla* sect. *Cyrtostigma* has a close morphological resemblance to *Sorocephalus* and has its distribution area in the high mountainous country of the north western centre, while *Spatalla* sect. *Spatalla* is mainly centered in the extreme south western Cape Province. At least four species considered to be advanced morphologically on account of their highly reduced inflorescences, inhabit the low lying country between Kleinmond and Bredasdorp. It is conceivable that these morphologically advanced and biologically vigorous species now occupying a recently exposed land surface, have developed from the morphologically primitive higher altitude forms which now appear to be in a state of senescence.

A REVISION OF SOROCEPHALUS R.BR.

Sorocephalus R.Br. in Trans. Linn. Soc. Lond. **10**: 139 (1810). Nom. cons. *Soranthe* Salisb. ex Knight. In Knight, Cult. Prot : 72 (1908). 1809.

Small shrubs or shrublets, up to 1.5 m tall, erect or decumbent. *Branches* covered with numerous erect often imbricate leaves. *Leaves* entire, linear, terete and grooved on the upper surface or semi-terete with a flat or slightly concave upper surface, rarely quite flat and lanceolate; apex mucronate. Surface of leaves glabrous, scabrous, or pubescent. *Inflorescence* terminal, globose to cylindric, usually single, rarely in clusters, sessile or pedunculate. Inflorescence compound, paniculate, rarely a capitulum; when paniculate, lateral racemes are 4—9 flowered. *Bracts and bracteoles* free, showing no signs of fusion, soft, glabrous or hairy, margins ciliate. Flowers bisexual, actinomorphic. *Perianth* straight in bud, showing no trace of curving or zygomorphy. Perianth differentiated into distinct limbs and claws, limbs elliptic, glabrous or pubescent, claws narrow to filiform, straight or twisting on opening, woolly sericeous or scabrous. Perianth tube glabrous or villous, cylindrical or slightly four angled. *Anthers* 4, sessile, inserted at the base of the perianth limbs, ovoid to ellipsoid, the connective being produced into a rounded or pointed black apical boss. *Style* 8—25 mm long, filiform, soon becoming constricted at junction with ovary. *Pollen presenter* terminal, erect, not oblique or in any way curved to one side, cylindric, ovoid, ellipsoid or capitate. Stigmatic groove terminal, on the apex of the pollen presenter. *Ovary* sessile, or minutely stipitate, clearly differentiated from the style base, ellipsoidal, pubescent or glabrous. *Ovule* single, pendulous, attached just below the apex of the locule. *Fruit* an achene, sessile to slightly stipitate, cylindrical or ellipsoidal; pericarp usually shiny, glabrous, brown and wrinkled when dry, broadly or narrowly emarginate at the base, rarely pubescent with a truncate but distinctly stipitate base.

Diagnosis: *Sorocephalus* is distinguished chiefly by its simple entire leaves, terete, semiterete, or lanceolate, its compound inflorescence (rarely a capitulum) of small (8—25 mm long) actinomorphic flowers, straight in bud, with straight filiform styles, and the glabrous (rarely pubescent) nut like fruits.

Nomenclature and type: Although *Soranthe* Salisb. ex Knight (1809), is earlier than *Sorocephalus* R.Br. (1810), *Sorocephalus* has been retained on account of its inclusion in the list of Nomina Conservanda adopted by the Vienna Congress in 1905. The type species is *S. imbricatus* (Thunb.) R.Br.

Etymology: The name is a compound of two Greek words, *soros*, a heap, and *cephale*, a head, alluding to the rather clustered heads and compacted inflorescence.

Distribution: South Africa: South Western Cape Province.

The genus is divided into three sections.

Section 1. **Mischocaryon** Endlicher.

Leaves terete and canaliculate on the upper surface, fruits glabrous, broadly emarginate at the base.

S. pinifolius; *S. alopecurus*; *S. clavigerus*; *S. palustris*; *S. crassifolius*; *S. teretifolius*.

Section 2. **Sorocephalus**.

Leaves flat, or semi-terete with a flattened or slightly concave upper surface, fruits glabrous narrowly emarginate at the base.

S. imbricatus; *S. scabridus*; *S. lanatus*; *S. capitatus*.

Section 3. **Dasycaryon** Rourke sect. nov.

Haec sectio distinguitur a fructibus hirsuti basibus truncati pedicellati.

S. tenuifolius.

KEY TO THE GENUS *SOROCEPHALUS*

- | | | |
|----|---|------------------------|
| 1 | Inflorescence a capitulum | 6. <i>teretifolius</i> |
| 1 | Inflorescence compound, paniculate. | |
| 2 | Leaves terete, canaliculate on the upper surface. | |
| 3 | Involucres all 4 flowered, inflorescence 1.5 cm in diam., 1.5 cm long | 5. <i>crassifolius</i> |
| 3 | Involucres 5—9 flowered, inflorescence more than 2 cm. long. | |
| 4 | Leaves 40 mm or more long. | |
| 5 | Perianth limbs glabrous | 1. <i>pinifolius</i> |
| 5 | Perianth limbs villous | 2. <i>alopecurus</i> |
| 4 | Leaves less than 25 mm long. | |
| 6 | Stems erect, leaves more or less straight, fruits cylindric, glabrous | 3. <i>clavigerus</i> |
| 6 | Stems decumbent, leaves curved upwards, fruits broadly elliptic to ovoid, puberulus basally | 4. <i>palustris</i> |
| 2 | Leaves flat, or, semi-terete with a flattened or concave upper surface. | |
| 7 | Leaves completely flat, ovate lanceolate, 5 mm wide | 7. <i>imbricatus</i> |
| 7 | Leaves semi-terete, upper surface flat or slightly concave, less than 5 mm wide. | |
| 8 | Perianth limbs glabrous | 9. <i>scabridus</i> |
| 8 | Perianth limbs pubescent. | |
| 9 | Pollen presenter markedly capitate | 8. <i>capitatus</i> |
| 9 | Pollen presenter ellipsoidal or cylindrical. | |
| 10 | Bracts and bracteoles acute, fruits glabrous | 10. <i>lanatus</i> |
| 10 | Bracts and bracteoles acuminate, fruits hirsute | 11. <i>tenuifolius</i> |

(1) ***Sorocephalus pinifolius*** (Salisb. ex Knight) Rourke, comb. nov.

Soranthé pinifolia Salisb. ex Knight in Knight, Cult. Prot. : 72 (1809) Basionym.

Sorocephalus imberbis R.Br. in Trans. Linn. Soc. Lond. **10**: 140 (1810).

Sorocephalus imberbis R.Br. var. *longifolius* Meisn. in DC., Prodr. **14**: 303 (1856).

Sorocephalus longifolius (Meisn.) Phillips in Kew Bull. **1911**: 85 (1911).

An erect sparsely branched shrub with a single stout main stem, to 1 m. Branches erect, terete, stout, tomentellous when young, soon glabrous. Leaves acicular terete, long and slender, canaliculate on the upper surface, 40–60 mm long, apex mucronate. Inflorescence terminal, sessile, globose to ovoid, 2.5 cm in diam. Involucres 8 flowered, occasionally 7 or 9 flowered. Bracts narrowly lanceolate acuminate, 8–9 mm long, tomentose. Bracteoles narrowly lanceolate acuminate, 7 mm long, sericeous. Perianth 12 mm long. Perianth limbs glabrous, narrowly ovate, 1 mm long. Perianth claws filiform, becoming coiled and twisted on opening, thickly villous. Perianth tube glabrous, 3 mm long, distinctly quadrangular, slightly inflated at the base. Anthers sessile 1 mm long, apical boss poorly differentiated. Style straight, filiform, 10 mm long. Pollen presenter ovoid, with a minute terminal stigmatic papilla. Ovary ellipsoid, 1 mm long, minutely stipitate, puberulous. Hypogynous scales linear, obtuse. Fruits ellipsoid cylindrical, broadly emarginate at the base, minutely stipitate, faintly grooved on one surface, glabrous, becoming wrinkled, 5–6 mm long.

Diagnosis: This species is readily identified by the very long acicular terete leaves (5 cm), canaliculate on the upper surface, the glabrous perianth limbs and the ovoid pollen presenter.

The type of this species was collected by Niven "on the tops of the mountains near Tyger Hoek", which is near the town of Riversonderend. Both Knight (1809), and Brown (1810) published descriptions of this collection, but as Knight's epithet is the earlier, it has priority. A collection made by Zeyher at Appels Kraal was described as *Sorocephalus imberbis* var. *longifolius* by Meisner, and in 1911 Meisner's variety was given specific rank by Phillips. Niven's original collection was made from rather old depauperate plants for his specimens are stunted and gnarled, while Zeyher's collection was made from vigorous young material. After having compared the type material of both taxa, I have no hesitation in reducing *S. longifolius* (Meisn.) Phillips to synonymy.

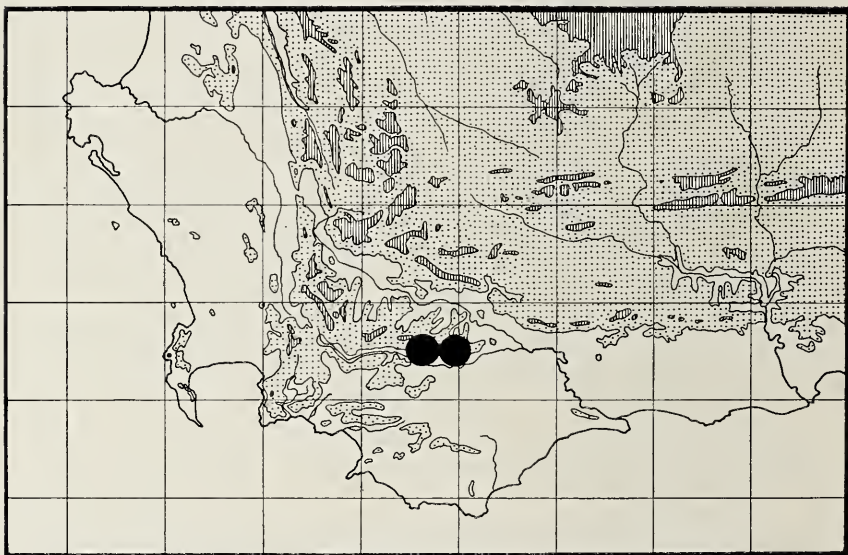
Type Material: "Tops of mountains near Tyger Hoek, 2 ft. high, alpine" Niven in herb. Salisbury (K).

Distribution, Ecology and Biology: This species is restricted to the mountains around Riversonderend where it occurs on the cool south facing slopes. Flowering commences in June and continues into October.

Specimens Examined:

CALEDON: Riversonderend mts., Oct., *Stokoe* s.n. (SAM 58910); Appels Kraal, Riversonderend, Zeyher 3718 (NBG, BOL, PRE, NY); Riversonderend, June, *Davis and Stokoe* s.n. (SAM 61913); Esperance, foot of the Riversonderend mts., at Lindeshof, Oct., *Stokoe* 9254 (BOL, NBG); Morningstar, Riversonderend, July, *Swart* 38 (NBG); Tops of the mountains at Tyger Hoek, *Niven* 100 (K).

WITHOUT PRECISE LOCALITY: Africa australis, e coll. Hibbert, *Niven* (BM).



Map 3. Distribution of *Sorocephalus pinifolius* (Salisb. ex Knight) Rourke.

(2) *Sorocephalus alopecurus* Rourke, sp. nov.

Differt a *S pinifolii* inflorescentiis longioribus, perianthiis limbis hirsutis vel hispidis.

Caulis basi nudi cum cicatricibus foliorum asperis prominentibus. *Folia* 30—50 mm longa, aciculares teres, glabra, supra canaliculata. Folia laxè imbricata, assurgentes. *Inflorescentia* cylindracea, 5—6 cm longa, 2 cm lata; flores compactos. *Involucra* 8—9 floribus. *Perianthium* 10—12 mm longum. Perianthii limbus hirsutus ad hispidis. *Stylus* rectus, filiformis; stigma ovoidea.

PLATE 2.

Sorocephalus alopecurus Rourke. The inflorescence just before anthesis. Part of the type material, *Williams* 1041. (× 2).



An erect, sparsely branched shrub, 1 m tall. *Branches* stout, terete, covered with long, loosely imbricate leaves. Leaf scars on branches prominent. *Leaves* acicular terete, mucronate, upper surface canaliculate, glabrous, 30—50 mm long. *Inflorescence* terminal, cylindrical, single or clustered, often with a well developed lanate peduncle. Inflorescence 5—6 cm long, 2 cm in diam. Involucral bracts at base of peduncle, linear attenuate, sericeous, 5—6 mm long. *Involucres* 8—9 flowered, subtended by a narrowly lanceolate acuminate bract, glabrous at apex, villous at base. Bracteoles narrowly ovate narrowing to the base, very densely lanate. *Perianth limbs* narrowly ovate, hirsute to villous. *Perianth claws* filiform, much twisted below the perianth limbs. *Perianth tube* glabrous, 3 mm long, distinctly quadrangular, inflated at the base. *Style* filiform, 10 mm long, terminated by an ovoid pollen presenter. *Ovary* ellipsoidal, 1.5 mm long, sericeous. *Hypogynous scales* linear subulate, somewhat flattened. *Fruits* oblong ovoid, glabrous, broadly emarginate at the base.

Diagnosis: *S. alopecurus* differs from *S. pinifolius* in that it has a longer, more cylindric inflorescence and hirsute to hispid perianth limbs (not glabrous as in *S. pinifolius*).

Type Material: From the farm Nooitgedacht near Greyton, Caledon district, Sept., *I. Williams* 1041, holotype in Compton herbarium (NBG).

For many years the exact locality of this species was unknown. Specimens were frequently exhibited at the Caledon wild flower show, "without precise locality" and were subsequently preserved in the Bolus herbarium. Only recently has it been established that this species occurs on the Riversonderend mountains. It appears to be confined to the south slopes of the Riversonderend range between Olifants Kop to the west of Genadendal, and the farm Nooitgedacht near Greyton which is situated east of Genadendal.

Specimens Examined:

CALEDON: Slopes leading to Olifants Kop, between Villiersdorp and Genadendal, Riversonderend range, Nov., *Esterhuysen* 32081 (BOL, NBG); From the Farm Nooitgedacht near Greyton, Sept., *Williams* 1041 (NBG); Caledon wild flower show, Sept., *Compton* 5634 (BOL); Caledon wild flower show, Sept., *L. Guthrie* 339 (BOL); Caledon wild flower show, said to come from Riversonderend, Sept., *Compton* 3666 (BOL, NBG).

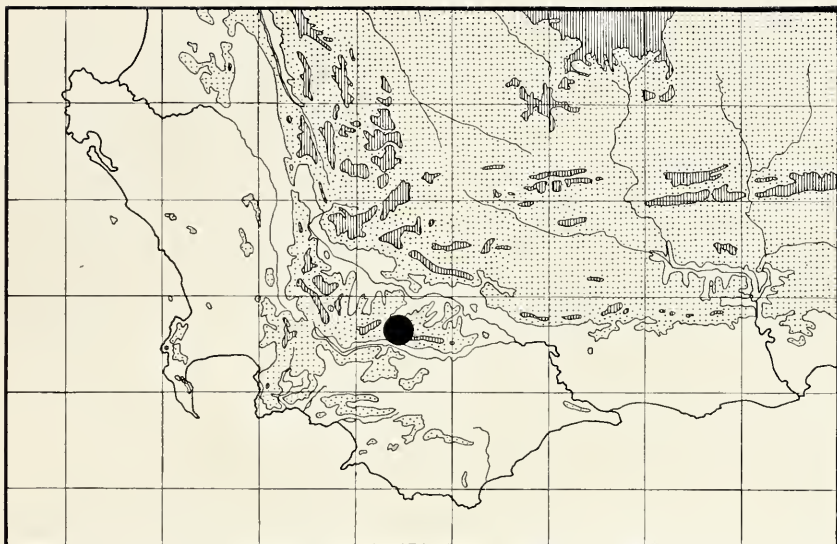
(3) *Sorocephalus clavigerus* (Salisb. ex Knight) Hutchinson in Dyer, Fl. Cap. 5 pt. 1 : 705 (1912).

Sorranthe clavigera Salisb. ex Knight in Knight, Cult. Prot.: 73 (1809).

Sorranthe montana Salisb. ex Knight in Knight, Cult. Prot.: 73 (1809).

Sorranthe rupestris Salisb. ex Knight in Knight, Cult. Prot.: 72 (1809).

Sorocephalus rupestris (Salisb. ex Knight) Phillips in Kew Bull. 1911: 86 (1911).



Map 4. Distribution of *Sorocephalus alopecurus* Rourke.

An erect sparingly branched shrub to 1 m tall. *Branches* stout, terete, tomentellous when young, glabrous later, the older branches covered with rough leaf scars. *Leaves* imbricate, acicular terete, 7–25 mm long. Apex mucronate, upper surface of leaf canaliculate, pilose when young, soon glabrous. *Inflouescence* terminal, single, globose to broadly cylindrical, up to 4 cm in diam. *Bracts* narrowly lanceolate acute, glabrous to villous, up to 12 mm long. *Involucre*s 6 to 9 flowered at the base, becoming 1 flowered at the apex of the inflorescence. *Bracteoles* narrowly lanceolate acute, 5–15 mm long, villous at the base, apex usually glabrous and hard, slightly incurved, margins minutely toothed. Bracteoles somewhat naviculiform. *Perianth* 7–15 mm long, pale yellowish to cream in fresh state. *Perianth limbs* elliptic, villous to lanate. *Perianth claws* linear, becoming twisted on opening, villous to sericeous. *Perianth tube* glabrous, quadrangular. *Style* up to 14 mm long, filiform, terminated by an ellipsoidal pollen presenter. *Ovary* ellipsoid, 1 mm long, minutely sericeous. *Hypogynous scales* 1–1.5 mm long, linear subulate. Fruits cylindrical, 5–6 mm long, broadly emarginate and pedicellate at the base, glabrous, dark brown.

Diagnosis: *S. clavigerus* is distinguished from the related *S. palustris* by the stiff, erect growth habit, and the cylindric fruits.

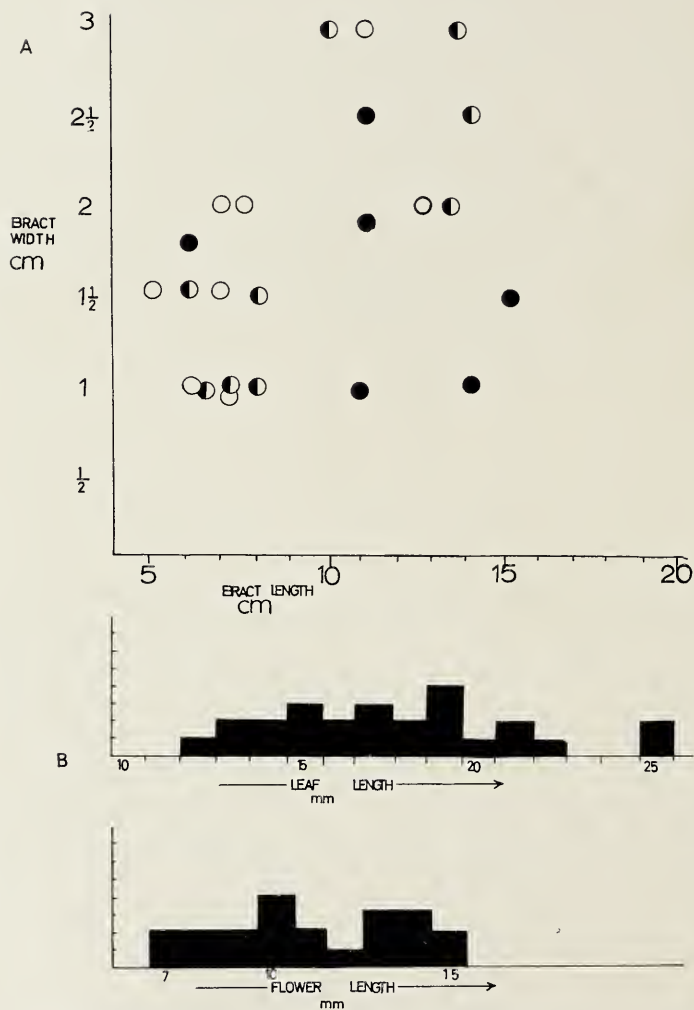


FIG. 9: *Sorocephalus clavigerus*. (A) Scatter diagram to show variation in size and pubescence of the involucre bracts. Open circle = bracts glabrous; Blackened circle = bracts pubescent; Half blackened circle = bracts pubescent at base, glabrous above. (B) Histograms showing variation in leaf and flower length.

In 1809 Knight described three species of *Sorocephalus* simultaneously, which he placed in the genus *Soranthe*. They are; *S. rupestris*, *S. montana* and *S. clavigerus*. The types of these three species were examined when on loan from Kew (K). Although the types are rather inadequate, it is clear that they all belong to the same species. As the type of *Sorocephalus clavigerus* is more complete, it has been decided that this name should be adopted.

Francis Masson was apparently the first person to collect this species, the locality according to Knight being the tops of the Stellenbosch mountains. Masson must have collected seeds, for Knight records that it flowered in the nursery of Lee and Kennedy during the period 1808 to 1809. Specimens were also collected by Niven on the Klein River mountains and again seeds must have been collected for it was introduced into Hibbert's garden at Clapham in 1803.

Type Material: French Hoek Kloof, Niven 40, holotype in the Kew herbarium (K).

Distribution: *S. clavigerus* has a wider distribution range than most species in the genus, extending from the Jonkershoek mountains along the Hottentots Holland to the Kleinmond and Klein River mountains.

Ecology and Biology: The entire distribution range of *S. clavigerus* falls within a zone of high winter rainfall (50—70" p.a.). It normally grows socially in small groups on sandy or stony, always well drained areas, in open hilly country. Plants growing in very rocky situations tend to be small and rather stunted. Flowering takes place between July and December.

Variation: This is a variable species in the dimensions of the floral and vegetative parts which in general tend to be slightly larger on the specimens from the more southerly localities. Both leaf and flower length varies over a considerable range as is shown in the accompanying histograms. The dimensions and pubescence of the bracts are also variable. These may be glabrous, villous, or with the upper half of the bract glabrous and the lower half villous. (See Fig. 9).

Specimens Examined:

STELLENBOSCH: Tops of the Stellenbosch mts., Niven 28 (K); French Hoek Kloof, Niven 40 (K); Little Dwasberg peak, Jonkershoek, Rycroft 1491 (BOL).

SOMERSET WEST: Somerset Sneeuwkop, Esterhuysen 8245 (BOL); Hottentots Holland, *Stokoe* s.n. (PRE 29731); Somerset Sneeuwkop, Dec., *Stokoe* s.n. (PRE 29730); Landrost Kop, Esterhuysen 3555 (BOL); Somerset Sneeuwkop and Landrost Kop, *Stokoe* 6533 (BOL); Hottentots Holland mts., *Stokoe* s.n. (BOL 17739); Somerset Sneeuwkop, *Stokoe* 6717 (BOL); Between Somerset Sneeuwkop and Landrost Kop, *Stokoe* s.n. (SAM 54169); Somerset Sneeuwkop, *Stokoe* s.n. (SAM 56390).

CALEDON: Mountains near the Palmiet River mouth, Dec., *Stokoe* 979 (PRE); Mountain plateau near Klein River, *Stokoe* 937 (BOL); Kleinmond, *Stokoe* s.n. (BOL 18390); Tops of the mountains above Kleinmond, Williams 538 (BOL); Hottentots Holland mountains, Rooi Els area, *Stokoe* 6529 (BOL); Kleinmond, near the Palmiet River mouth,

July, *Stokoe* s.n. (PRE 29974); Mountain plateau above Kleinmond, Dec., *Rourke* 29 (BOL); Paardeberg, above Kleinmond, Nov., *Rourke* 980 (NBG); Sept., *Rourke* 1106 (NBG).

WITHOUT PRECISE LOCALITY: In herb. Webbianum, ex herb. Labillardiere (FI); Cape, *Niven* 27, comm. Lambert (FI).



Map 5. Distribution of *Sorocephalus clavigerus* (Salisb. ex Knight) Hutchinson.

(4) *Sorocephalus palustris* Rourke, sp. nov.

S. clavigeri affinis, sed differt propter caules decumbentes. Fructus ovoideus ellipsoideus modice pubescens et squamae hypogynae subulatae minutae (0.5 mm longae) characteres distinguens itidem sunt. Crescit in turfosa.

Frutex humilis, 20 cm altus. *Caules* decumbentes tegetes formantes. *Inflorescentia* terminalia pedunculata, 20 mm longa. *Involucra* infima 7—9-flora, uniflora ad apicem. *Perianthium* 12 mm longum, villosum crispum. *Stylus* 10 mm longus, strictus, filiformis. *Stigma* cylindracea ellipsoidea. *Squamae hypogynae* subulatae minutae, 0.5 mm longae. *Fructus* 5—6 mm longus 2.5 mm latus, ovoideus ellipsoideus modice pubescens, basi emarginata pedicellata.

A low decumbent shrublet, sprawling, forming mats 2 ft. in diam., seldom more than 20 cm tall. *Branches* slender, prostrate, covered with somewhat upwardly turned imbricate leaves. *Leaves* acicular terete, 15—20 mm long, canaliculate on the upper surface, pilose at first, soon glabrous, mucronate. *Inflorescence* terminal, globose, 2 cm long. *Bracts* narrowly lanceolate acuminate, villous at base, glabrous towards apex, margins incurved. *Involucres* 4—7 flowered at base of inflorescence one flowered at apex. *Bracteoles* lanceolate acuminate, villous, 5 mm long. *Perianth limbs* narrowly elliptic, woolly. *Perianth claws* becoming coiled on opening villous to crisped. *Perianth tube* 1.5 mm long, glabrous to crisped. *Style* filiform, 10 mm long. *Pollen presenter* cylindric ellipsoidal, scarcely differentiated from the style. *Anthers* sessile, elliptic, tipped with a black apical boss. *Ovary* ovoid ellipsoid, 1 mm long, minutely stipitate, sericeous. *Hypogynous scales* minute, subulate, 0.5 mm long. *Fruits* broadly ellipsoid ovoid, 5—6 mm long, 2.5 mm broad, pubescent in basal region, broadly emarginate and pedicellate at base.

Diagnosis: *S. palustris* is distinguished by its prostrate decumbent growth habit, the broadly ellipsoid ovoid fruits which are slightly pubescent at the base and the minute hypogynous scales, 0.5 mm long.

Type Material: Kogelberg, in a gully to the south east of the summit, Feb., Rourke 324, holotype in Compton herbarium (NGB).

Distribution, Ecology and Biology: This previously undescribed species is known only from the summit of Kogelberg and an adjacent peak. It grows in black peaty soil in a gully to the south east of the summit of Kogelberg at an altitude of 4,000 ft., and in a similar situation on the summit of a peak at the north east end of Five Beacon Ridge about half a mile to the east of the main peak of Kogelberg. The peaty sponges on which the plants grow are almost

permanently saturated due to the high winter rainfall (50—100" p.a.) and the moisture laden south easterly clouds which shroud these peaks almost daily during the summer months. The associated vegetation consists mainly of *Chondropetalum mucronatum*, *Brunia alopecuroides*, *Mimetes hottentotica* various *Ericaceae* and *Sphagnum* spp.

Specimens Examined:

CALEDON: Kogelberg, in a gully south east of the summit, Feb., *Rourke* 256 (NBG); Feb., *Rourke* 324 (NBG); North end of Five Beacon Ridge, Kogelberg mountains, Dec., *Williams* 1379 (NBG).

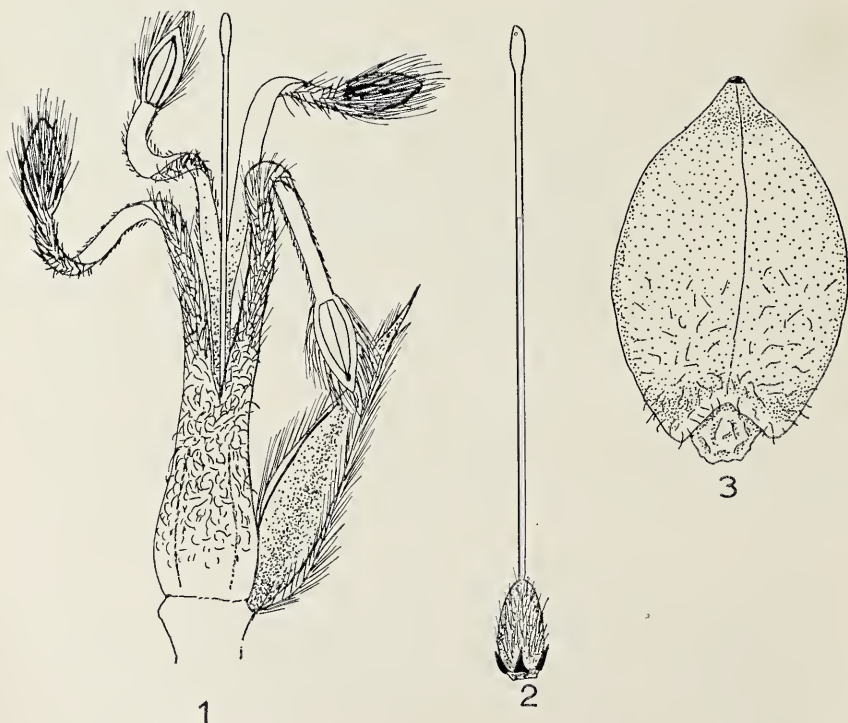


FIG. 10: *Sorocephalus palustris*. (1) complete flower ($\times 8$) (2) style and ovary showing the minute hypogynous scales ($\times 10$) (3) fruit. ($\times 6$).

Map 6. Distribution of *Sorocephalus palustris* Rourke.(5) *Sorocephalus crassifolius* Hutchinson in Dyer, Fl. Cap. 5 : 707 (1912).

A low, rounded, compact, much branched woody shrublet, 30—50 cm in height. *Stems* short, rigid, arising from a woody persistent rootstock. Leaves terete, 20—25 mm long, stout, 2 mm broad, canaliculate on the upper surface, mucronate; glabrous, but sparsely covered with long weak hairs when young. *Inflorescence* sessile, subglobose, 1.5 cm in diam. *Involucres* four-flowered, pedicellate, subtended by a lanceolate acuminate bract, glabrous towards the apex, strigose at the base. *Bracteoles* lanceolate acuminate, pubescence short, dense and crisped. *Perianth* 9 mm long. *Perianth limbs* narrowly ovate to lanceolate acute, thinly hispid to glabrous. *Perianth claws* linear, tomentelose, becoming twisted and coiled on opening. *Perianth tube* slightly constricted, 1 mm long, glabrous. *Style* filiform, terminated by a dark brown ellipsoid to cylindric pollen presenter; 7—8 mm long. *Ovary* thinly sericeous, ellipsoid. *Hypogynous scales* subulate, 1 mm long. *Fruits* ovoid, broadly emarginate and pedicellate at the base, glabrous.

Diagnosis: The small inflorescence (1.5 cm in diam.), very stout terete leaves, canaliculate on the upper surface and the almost glabrous perianth limbs make this an easily distinguishable species. A notable biological feature of *S. crassifolius* is its persistent rootstock from which shoots soon arise after burning.

The taxonomy of this species has been very confused for more than one hundred years. Since the time of Meisner (1856), it has been interpreted as being *Sorocephalus salsoloides* R.Br. On examining the type of *Sorocephalus salsoloides* R.Br., it proved to be a species of *Spatalla* which I had hitherto assumed to be undescribed and which is now known as *Spatalla salsoloides* (R.Br.) Rourke. The confusion was chiefly due to Meisner who cited not only the original Roxburgh collection [i.e. *Spatalla salsoloides* (R.Br.) Rourke], but also collections made by Drège and Krauss from the summit of the Genadendal mountains (i.e. *Sorocephalus crassifolius* Hutchinson), all under the name *Sorocephalus salsoloides* R.Br. It is clear that monographers of the Cape Proteaceae after 1810 could not have examined or dissected Brown's type with any care; if they had, the fundamental differences in the inflorescence structure of these two taxa would have been apparent, but it must be admitted that these two taxa,

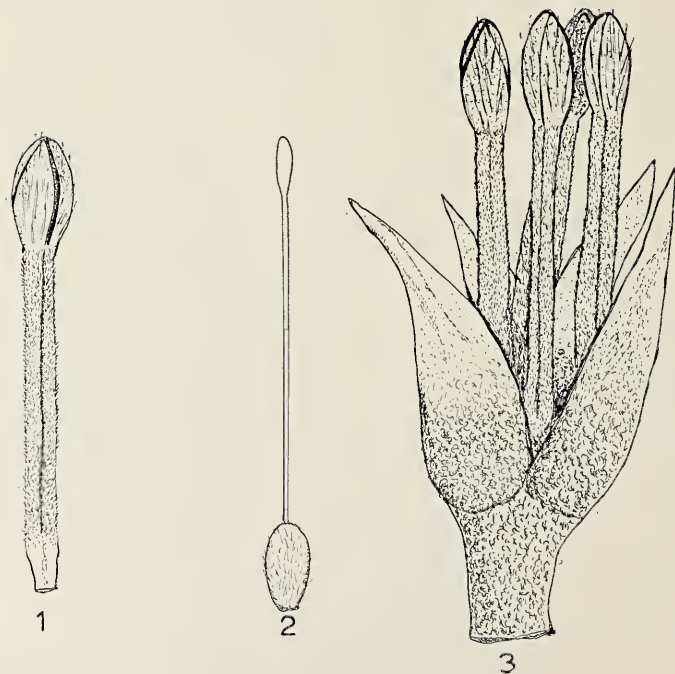
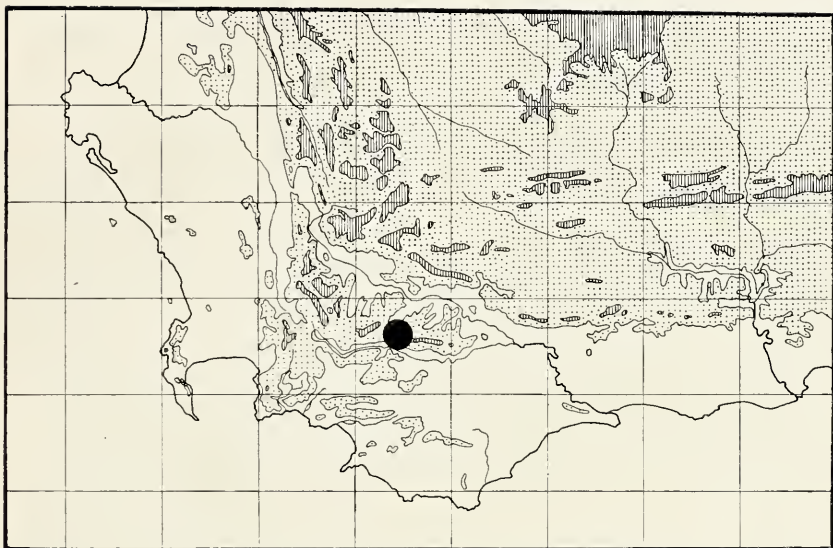


FIG. 11: *Sorocephalus crassifolius*. (1) Perianth before anthesis ($\times 10$) (2) style and ovary ($\times 11$) (3) complete involucre showing four flowers each subtended by a bracteole ($\times 10$).



Map 7. Distribution of *Sorocephalus crassifolius* Hutchinson.

although they belong to different genera, do resemble each other superficially. The confusion was perpetuated by Phillips and Hutchinson in the *Flora Capensis*, who continued to cite two discordant elements under the name *Sorocephalus salsoloides* R.Br. However, an additional species, *Sorocephalus crassifolius* Hutchinson, was described and is the first validly published name to be attached to this species.

Type Material: Genadendal mountain, Dec , *Schlechter* 9832, lectotype in herb. Kew (K).

Distribution, Ecology and Biology: This rare species is known only from the summit of Kanonkop above Genadendal. On two occasions the author visited this site during the known flowering period, but as the plants were regenerating after burning no flowering shoots had yet been produced. The only three plants that were found were growing on shallow, peat filled mossy ledges at 4,800 ft. on the cool south east cliffs below the summit. Collectors records indicate that flowering occurs from December to February.

Specimens Examined:

CALEDON: Genadendal mountain, *Krauss* 1058 in herb. Meisner (NY); Genadendal mountains, Jan., *Bolus* 7417 (BOL); Tops of the mountains of Baviaans Kloof, Genadendal,

Burchell 7723 (K, PRE); Genadendal mountain, Dec., Schlechter 9832 (BOL, SAM, PRE, S, G, K); Caledon, Nov., Feb., 1827, Jules Verreaux (G); At Genadendal, 28/10/1832, Drège (P).

WITHOUT PRECISE LOCALITY: South Africa, Sonder 17 (S); Ludwig s.n. in herb. Meisner (NY).

(6) *Sorocephalus teretifolius* (Meisn.) Phillips in Kew Bull. 1911 : 85.

Sorocephalus lanatus (Thunb.) R.Br. var. *teretifolius* Meisn. in DC., Prodr. 14 : 305 (1856).

A low erect shrublet to 0·7 m tall, branches tomentose when young becoming glabrous later, covered with loosely imbricate terete leaves. *Leaves* acicular terete, bluntly mucronate, canaliculate on the upper surface, 10—14 mm long, pilose when young, soon glabrous. *Inflorescence* a single terminal capitulum 1·5—2 cm in diam. Flowers arise from a globose receptacle, each flower being subtended by a bracteole. *Involucral bracts* massed around the base of the receptacle, narrowly ovate to lanceolate acute, 2—3 mm long, glabrous to pilose, margins ciliate. *Bracteoles* very narrowly elliptic to lanceolate acute. Outer surface sericeous. *Perianth* 6—7 mm long, deep carmine when fresh. *Perianth limbs* elliptic, woolly. *Perianth claws* filiform, spirally twisted in the open flower, sericeous. *Perianth tube* 1 mm long, cylindric, glabrous. *Style* filiform, 10—12 mm long. *Pollen presenter* cylindric to ellipsoid. *Ovary* ellipsoid, sericeous. *Hypogynous scales* linear subulate, 1 mm long. *Fruits* cylindrical, 6 mm long, 2 mm broad, glabrous, broadly emarginate and pedicellate at the base.

Diagnosis: *S. teretifolius* may at once be distinguished from all other species of *Sorocephalus* by the inflorescence, which is a capitulum.

The type collection was made by Drège in the Du Toits Kloof mountains at an altitude of 3,000—4,000 ft. Meisner, when revising the genus in 1856 referred to this collection as *S. lanatus* R.Br. var. *teretifolius* and in 1911 Phillips raised his variety to specific rank. No indication of the exact location of the type is given by Meisner, but after examining his notes and comments on the sheet bearing the Drège specimen in his own herbarium it seems clear that the type description was compiled from this specimen, and it has therefore been designated as the lectotype.

Type Material: Du Toits Kloof, Drège, lectotype in Herb. Meisner, New York Botanical Gardens (NY).

Distribution, Ecology and Biology: Very few collections of *S. teretifolius* have been made since the time of Drège. Recent collectors have established the existence of *S. teretifolius* on several neighbouring peaks in the Du Toits Kloof—Wemmershoek area, yet the exact locality of Malbrokskloof where

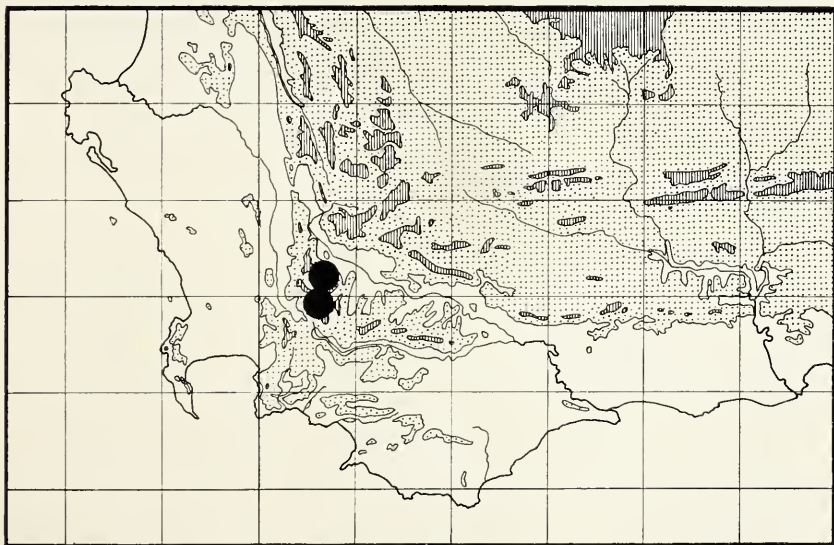
Drège made two collections of this species on different occasions is still uncertain. After studying Drège's itinerary and the other plant material collected at Malbrokskloof it seems to me most probable that Malbrokskloof is the large kloof (unnamed on modern maps), which is situated between Hugenoots Kop, the Seven Sisters and the Havekwas range, about one and a half miles north of the summit of Du Toits Kloof pass. If this assumption is correct, then the present known distribution range extends from just north of Du Toits Kloof southwards to Wemmershoek Peak and eastwards to Du Toits Peak.

S. teretifolius is a high altitude species that grows only between 5,000 and 6,000 ft. Although it is restricted to a region of high winter rainfall (50—70" p.a.), rocky, well drained, rather dry slopes appear to be the favoured habitat. The flowering period is brief, lasting from November to December,

Specimens Examined:

PAARL: Winterberg, Wemmershoek mts., Dec. Esterhuysen 9639 (BOL, NBG, PRE). Between Uitkyk and Malbrokskloof, 7/2/28, Drège 1489a (P). Between Uitkyk and Malbrokskloof, 19/9/33, Drège 1489 (P). Du Toits Kloof, 30/9/28, Drège 1489aa (P); Du Toits Kloof mts., Drège s.n. (NY, SAM, PRE, G, CGE). On the summit ridge of Wemmershoek Peak, Dec., W. P. Jackson s.n. (NBG).

WORCESTER: Between Du Toits Peak and Goudini Sneeuwkop, on a rocky ridge, Dec., Esterhuysen 31668 (BOL, NBG).



Map 8. Distribution of *Sorocephalus teretifolius* (Meisn.) Phillips.

(7) *Sorocephalus imbricatus* (Thunb.) R.Br. in Trans. Linn. Soc. Lond. 10 : 142 (1810).

Protea imbricata Thunb., Diss. Prot. : 38 tab. 5 (1781).

Soranthé glanduligera Salisb. ex Knight in Knight, Cult. Prot. : 71 (1809)
Nom. illegit.

Soranthé imbricata (Thunb.) O. Kuntze, Rev. Gen. Pl. 2: 582 (1891).

A slender, sparsely branched shrub with a single stout main stem. *Branches* covered with densely imbricate leaves. *Leaves* flattened, lanceolate acute, 5 mm wide, 15 mm long, apex mucronate or hooked, thinly pilose when young becoming glabrous and scabrous later. *Inflorescence* terminal, globose, usually single, up to 4 cm in diam. *Involucres* 4 flowered, pedicellate, subtended by a lanceolate acuminate bract to 14 mm long, scabrous on the outer surface, margins ciliate. *Bracteoles* narrowly lanceolate, densely ciliate, to 8 mm long. *Perianth* 10 mm long. *Perianth limbs* ovate elliptic, densely bearded with long, straight, silky hairs. *Perianth claws* filiform, scabrous, thinly covered with clavate glandular hairs. *Perianth tube* cylindric, 3 mm long, glabrous. Ovary ellipsoidal, glabrous, minutely stipitate. *Style* filiform, 9 mm terminated by a narrowly ovoid to ellipsoidal pollen presenter. *Hypogynous scales* absent. *Fruits* oblong cylindric, 5—6 mm long, brown and shiny, narrowly emarginate at the base.

Diagnosis: This species is readily distinguishable from all others in the genus by its flattened, lanceolate leaves. The absence of hypogynous scales and the clavate glandular hairs on the perianth are further diagnostic characters.

Type Material: South Africa, without precise locality (but probably near the Tulbagh waterfall), *Thunberg*, sheet 2929 in Herb. Thunberg, holotype (UPS).

S. imbricatus was probably the first species of this genus to have been collected and judging by the numerous collections made by early travellers, it must have attracted considerable attention. Plants had been introduced to the Royal Botanic Garden at Kew as early as 1794 by Masson. It had also been introduced into Hibbert's collection in 1802 and a plant which flowered between 1802 and 1808 was figured by Andrews in the *Botanist's Repository* (See plate 1.).

Distribution, Ecology and Biology: Apart from a single collection on Piketberg by Bolus, *S. imbricatus* has only been recorded from the mountainous area surrounding the Tulbagh waterfall. Only three living plants have been seen by the author and these were growing on a shale band of Table Mountain sandstone on open Restio veld. Flowering occurs between September and December.

Specimens Examined:

TULBAGH: Mountains around the Tulbagh waterfall, *Bolus* 379 (BOL SAM); Near the Tulbagh waterfall, *Zeyher* s.n. (SAM 19840); Between Nieuwe Kloof and Elands Kloof, *Drège* (SAM, PRE, CGE); Winterhoek mountains, Nov., *Bolus* 5258 (BOL); Tulbagh waterfall, Sept., *Stokoe* 1400 (BOL, PRE); Waterfall at Nieuwekloof, 11/1/1829, *Drège* 1973 (P); Suurvlakte, between Elands Kloof and Klutjies Kraal, March, *Esterhuysen* 5096 (BOL); Tulbagh waterfall, Jan., *Marloth* 2842 (PRE); Above the Tulbagh waterfall, Sept., *Stokoe* 1461 (PRE); Mountains above the Roode Zand cascade, Oct. & Nov., *Niven* 46 (PH); Roode Zand cascade, *Niven* 77 (PH); Voelvlei mountains, north east end of Ontongs Kop, Sept., *Rourke* 591 (NBG); Roode Zand cascade ("4 or 5 ft. high"), *Niven* 15 (K); In interioribus Prom. b. spei, *Niven* (Comm. A. B. Lambert), (S); Roode Zand, Oct., *Dr. Roxburgh* 15, anno 1799 (G).

PIKETBERG: Piketberg mountains, Oct., *Bolus* 13639 (BOL).

WITHOUT PRECISE LOCALITY: *Verreaux* s.n. in herb. Meisner (NY); C.B.S., *Courbon* (G); *Sonnerat*, cat. no. 4131 in herb. de Jussieu (P—JU); Without collector in herb. Lamarck (P—LA); C.B.S., without collector, no. 30 in herb. Delessert (Burman collection) (G); C.B.S., *Jules Verreaux* anno 1831 (G); C.B.S., *Thunberg*, in herb. Bergius (SBT).

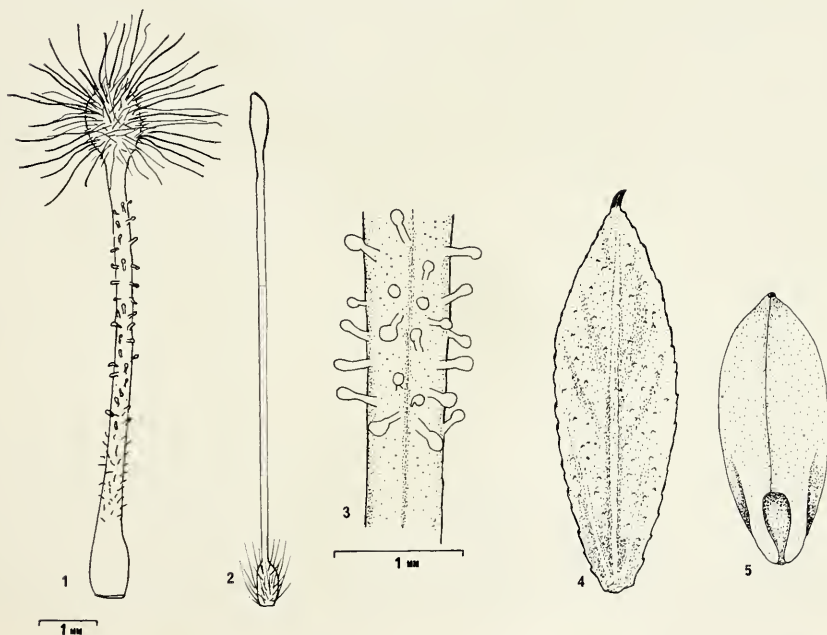
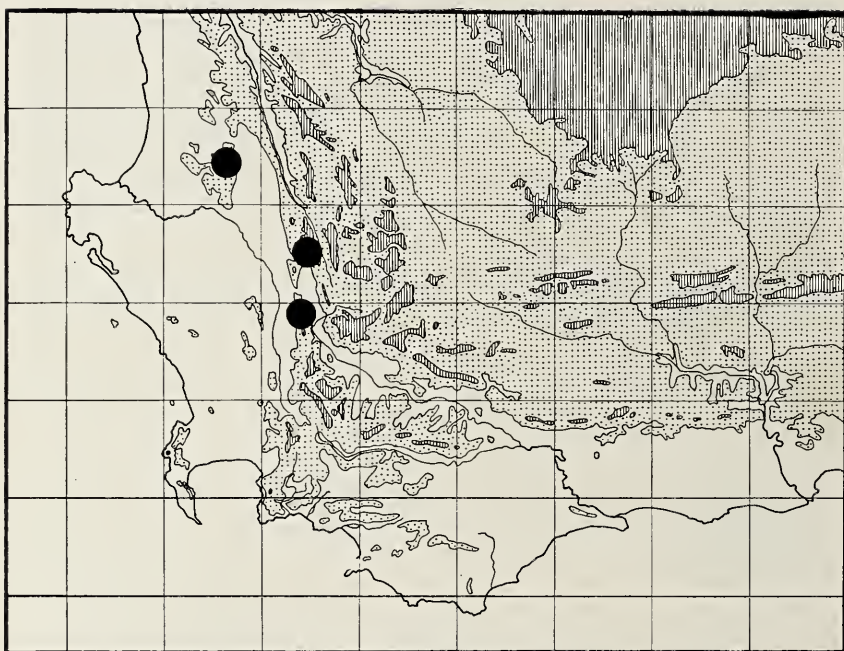


FIG. 12: *Sorocephalus imbricatus*. (1) Flower just before anthesis (2) ovary and pollen presenter ($\times 10$) (3) enlargement of perianth to show the glandular clavate hairs (4) leaf ($\times 5$) (5) Fruit, ($\times 8$).



Map 9. Distribution of *Sorocephalus imbricatus* (Thunb.) R.Br.

(8) *Sorocephalus capitatus* Rourke, sp. nov.

Haec species optime distinguitur propter stigma capitatum, involucrum 8—9 florum et squamas hypogynas incurvatus longissimas (3 mm. longas).

Frutex erectus ad 0.75 m altus. *Rami* elongati, stricti, foliis imbricatis dense obsiti. *Folia* anguste lanceolata 6—12 mm longa. *Inflorescentia* sessilis, terminalis, globosa, 2—3 cm longa et lata. *Involucra* 8—9 flora. *Perianthii limbus* extimis lanatus, perianthii limbus intimi glabrus. *Stylus* strictus, 9 mm longus. *Stigma* capitatum. *Squamulae hypogynae* incurvae, 3 mm longae. *Nux* glaberrima, basi anguste emarginata, brevissime pedicellata.

An erect well branched shrub with a strong main stem, 0.75—1 m tall, branching at 0.25 m. *Stems* slender, covered with closely clasping densely imbricate leaves. *Leaves* 6—12 mm long, narrowly lanceolate, slightly 3 ridged on the upper surface, otherwise flattened, sparsely sericeous at first becoming scabrous glabrescent later. *Inflorescence* terminal, single or with up to three



PLATE 3.

Sorocephalus capitatus Rourke. The glabrous perianth limbs of the innermost flowers of each involucre can be clearly seen. Part of the type material, *Rourke* 682. ($\times 2$).

inflorescences terminating a flowering shoot, globose, 2—3 cm in diam. *Involucres* 8—9 flowered, densely clustered together. Perianth limbs of the innermost flowers of the involucre glabrous, perianth limbs of the outermost flowers woolly. *Bracts* narrowly lanceolate to broadly ovate, 9 mm long, 1—5 mm broad. Outer surface usually glabrous, occasionally sparsely sericeous, margins densely ciliate. *Bracteoles* lanceolate to narrowly ovate, glabrous. *Perianth* 12 mm long. *Perianth limbs* narrowly ovate, woolly to glabrous. *Perianth claws* linear, densely woolly. *Perianth tube* 5 mm long, sericeous above, becoming glabrous and slightly inflated at the base. *Anthers* sessile, elliptic, apical boss black, pointed. *Style* filiform, 9 mm long. *Pollen presenter* capitate, with a terminal stigmatic papilla. *Ovary* ellipsoid, sericeous, 1 mm. long. *Hypogynous scales* linear subulate, 3 mm long, arching up over the ovary. *Fruits* glabrous, cylindrical, narrowly emarginate at the base, 6 mm long, 2 mm broad.

Diagnosis: *S. capitatus* is easily distinguished from the species with semi-terete leaves by the markedly capitate pollen presenter. The very long (3 mm) incurved hypogynous scales are also distinctive. A unique feature of this species is the variation in the pubescence of the perianth limbs. In each involucre the perianth limbs of the outermost flowers are lanate, while those of the innermost flowers are glabrous.

Type Material: On a plateau in the mountains at Onderbos Kloof, Cold Bokkeveld, Oct., *Rourke* 682, holotype in the Compton herbarium, Kirstenbosch (NBG).

Distribution: Only two isolated populations of this species are known, one on the Piketberg, the other in the mountains at Onderbos Kloof in the Cold Bokkeveld.

Ecology and Biology: *S. capitatus* grows in small colonies on sandy patches between weathered outcrops of Table Mountain sandstone. The associated vegetation consists mainly of low tufted Restionaceae. A moderate winter rainfall of 20—25" p.a. is experienced with occasional snowfalls during a severe winter. The flowering period is rather long, from October to February, and is due to the development of lateral inflorescences which arise below the main terminal inflorescence when it has faded.

Variation: Material from Piketberg has lanceolate bracts while specimens from Onderbos Kloof have broadly ovate bracts. Both populations are geographically isolated to such an extent that interbreeding is not possible. The morphological uniformity of each population and the constancy of the above-mentioned character difference between them is probably indicative of fairly long standing spatial isolation.

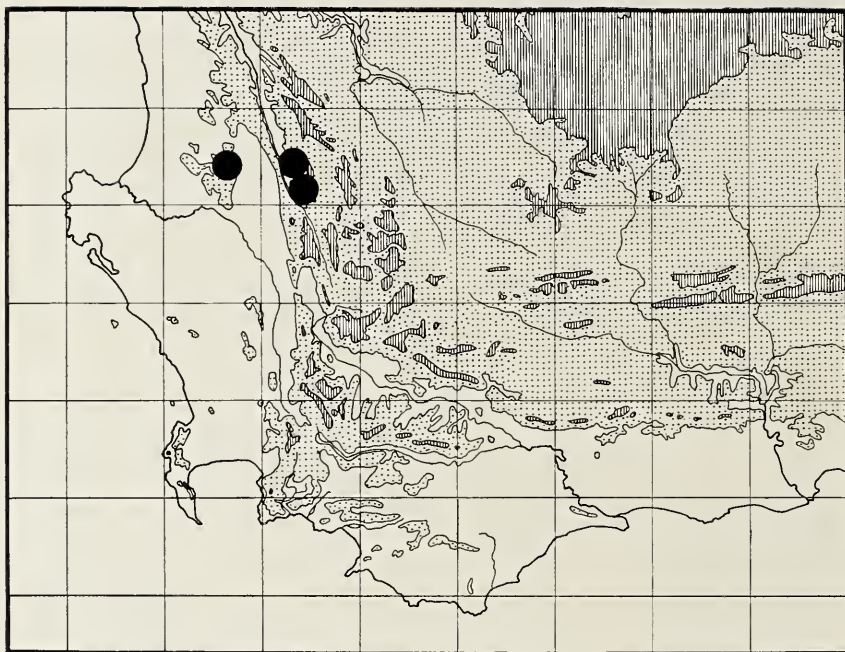
Specimens Examined:

PIKETBERG: Piketberg mts., Oct., *Bodkin* s.n. (BOL 13638, PRE); Between Avontuur hill and Zebra Kop, Piketberg mts., Nov., *Pillans* 7341 (BOL, NBG, SAM, PRE); Top of Piketberg mountain, *Martin* 886 (NBG); *Barker* 7567 (NBG); Piketberg mtn., *Zinn* s.n. (SAM 54615); Summit of Piketberg, *Stokoe* s.n. (SAM 62127); Zebra Kop, Piketberg *Stokoe* s.n. (SAM 61912); Near the summit of Piketberg, *Andreae* s.n. (SAM 62127).

CERES: Onderbos Kloof, Cold Bokkeveld, Oct., *Rourke* 682 (NBG); Valley between Skurfteberg and Witzenberg, *Thorne*, s.n. (SAM 53138); Onderbos Kloof, Jan., *Esterhuysen* 14308 (BOL); Dec., *Williams* s.n. (BOL). Boboskloof, Cold Bokkeveld, Oct., *Williams* 1114 (NBG); At the summit of Graskop, between Boboskloof and Onderboskloof, Cold Bokkeveld, Nov., *Rourke* 1138 (NBG).



FIG. 13: *Sorocephalus capitatus*. (1) Flower on opening ($\times 8$) (2) leaf ($\times 6$) (3) style ovary and pollen presenter showing the long hypogynous scales at base of ovary ($\times 8$) (4) fruit ($\times 12$).

Map 10. Distribution of *Sorocephalus capitatus* Rourke.

(9) *Sorocephalus scabridus* Meisn. in DC., Prodr. **14**: 303 (1856).

Soranthus scabridus (Meisn.) O. Kuntze, Rev. Gen. Pl. **2**: 582 (1891).

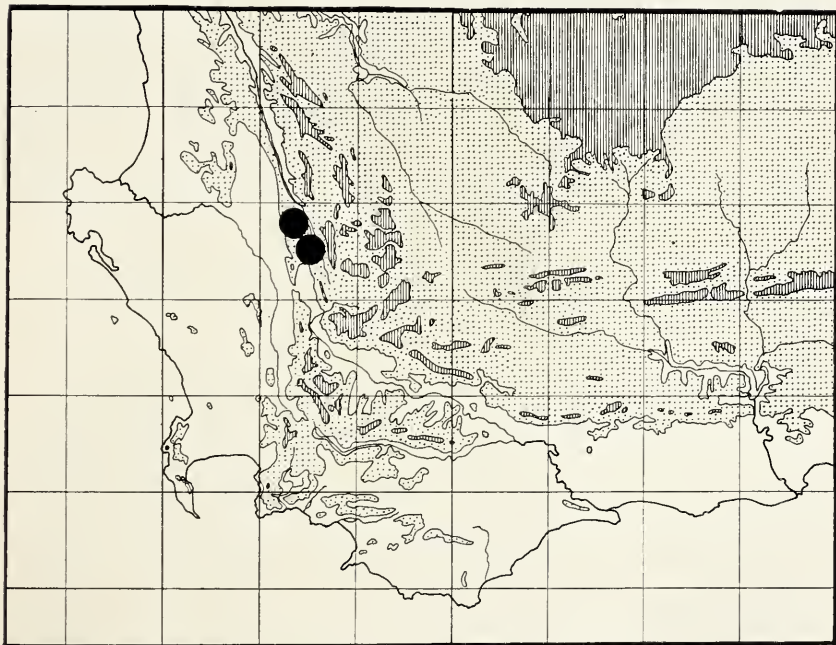
An erect sparsely branched shrub to 0.75 m tall. *Branches* slender, glabrous, covered with densely imbricate leaves. *Leaves* linear, semi-terete, flattened on the upper surface, sharply mucronate, 20–30 mm long; somewhat incurved to hooked at the apex, sparsely covered with long silky hairs when young becoming scabrous later. *Inflorescence* sessile, globose, 2–2.5 cm in diam. *Involucres* 7–9 flowered, subtended by a lanceolate attenuate bract. *Bracts* lanceolate attenuate, 7–8 mm long, outer surface glabrous, margins densely ciliate. *Bracteoles* narrowly lanceolate, glabrous, 4–5 mm long, margins densely ciliate. *Perianth limbs* ovate, 1 mm long, glabrous. *Perianth claws* filiform, lanate. *Perianth tube* glabrous, 3 mm long slightly quadrangular. *Anthers* sessile, broadly elliptic, with a minute black pointed apical boss. *Style* filiform, 10 mm long terminated by an ovoid pollen presenter. *Ovary* minute,

0.25 mm long, scarcely differentiated from the style, glabrous. *Hypogynous scales* absent. *Fruits* glabrous, 5 mm long, narrowly emarginate at the base.

Diagnosis: Distinguished by the 7—9 flowered involucre, the semi-terete leaves, the glabrous perianth limbs, the poorly differentiated ovary and the absence of hypogynous scales.

When Meisner described *S. scabridus*, four collections were cited in the type description. They are: South Africa, without precise locality, *Verreaux* s.n., *Ecklon* and *Zeyher* 16 and Winterhoek mts., near Tulbagh, *Mund* s.n., *Zeyher* 3718b. Of these only the *Verreaux* specimen was found in Meisner's herbarium, accompanied by a description in his own hand. Accordingly, this specimen has been selected as the lectotype.

Type Material: South Africa, without precise locality, *Verreaux* s.n., lectotype in herb. Meisner, New York Botanical Gardens (NY).



Map 11. Distribution of *Sorocephalus scabridus* Meisn.

Distribution, Ecology and Biology: Collections of this rather poorly known species have only been made from Great Winterhoek and the Twenty Four Rivers mountains. Herbarium records indicate that it grows on level sandy areas in mountainous country between 3,000 and 6,000 ft. Flowering occurs during October and November.

Specimens Examined:

PIKETBERG: Twenty Four Rivers mts., above Porterville, Oct., *Esterhuysen* 21881 (BOL, PRE); Twenty Four Rivers mts., Oct., *Esterhuysen* 16124 (BOL).

TULBAGH: Sneeuwgat, Great Winterhoek, April, *Phillips* 1841 (SAM); Winterhoek mountains, Nov., *Zeyher* 3718b (BOL, S).

WITHOUT PRECISE LOCALITY: *Verreaux* s.n. in herb. Meisner (NY); Without collector or loc., no. 126 in herb Webbium (FI); C.B.S. *Jules Verreaux* anno 1831, (G).

(10) *Sorocephalus lanatus* (Thunb.) R.Br. in Trans. Linn. Soc. Lond. **10**: 142 (1810).

Protea lanata Thunb., Diss. Prot.: 51, tab. 3 (1781).

Soranth ciliatiflora Salisb. ex Knight in Knight, Cult. Prot.: 72 (1809). Nom. illegit.

Sorocephalus phyllicoides Meisn. in DC., Prodr. **14**: 304 (1856).

Soranth lanata (Thunb.) O. Kuntze, Rev. Gen. Pl. **2**: 582 (1891).

Sorocephalus schlechteri Phillips in Kew Bull. **1911**: 85 (1911).

A low, much branched rounded shrub, or slender erect and sparsely branched, frequently sprawling or stunted, to 0.75 m tall. *Stems* terete, glabrous or pilose, often with an indumentum of short white incurved hairs. *Leaves* imbricate or widely spreading, 5—18 mm long, semi-terete, with a flattened or slightly concave upper surface, imbricate, spreading, or closely adpressed to the stem. Leaf surface glabrous or sparsely to densely covered with long spreading hairs becoming scabrous later. *Inflorescence* terminal globose, 1—3 cm in diam., usually single, rarely more than one inflorescence terminating a branch. *Involucres* usually 4 flowered, frequently 8 or 9 flowered, rarely 5, 6, or 7 flowered. *Bracts and bracteoles* very variable in form, lanceolate to broadly ovate, outer surface glabrous or sparsely to densely pubescent. *Perianth* 8—12 mm long. *Perianth limbs* elliptic densely lanate. *Perianth claws* filiform, densely lanate to villous. *Perianth tube* 2—3 mm long, cylindrical, puberulous to sericeous. *Style* filiform, 8—10 mm long. *Pollen presenter* ellipsoid to cylindric. *Ovary* ellipsoidal, 1 mm long, pubescent to glabrous. *Hypogynous scales* 1 mm long, subulate, yellow when fresh. *Fruits* cylindrical, glabrous, 5 mm long, narrowly emarginate at the base.

Diagnosis: Although *S. lanatus* is a rather polymorphic species it may be recognised by a combination of the following characters; the ellipsoid pollen

presenter, the semi-terete linear leaves, flattened to slightly concave on the upper surface, the lanate perianth and the glabrous cylindrical fruits, narrowly emarginate at the base.

Thunberg was the first botanist to collect, describe and illustrate this species. The exact locality of the type collection is uncertain, but it is highly probable that Thunberg obtained his specimen in Elands Kloof, through which he passed accompanied by Masson in September or October 1773.

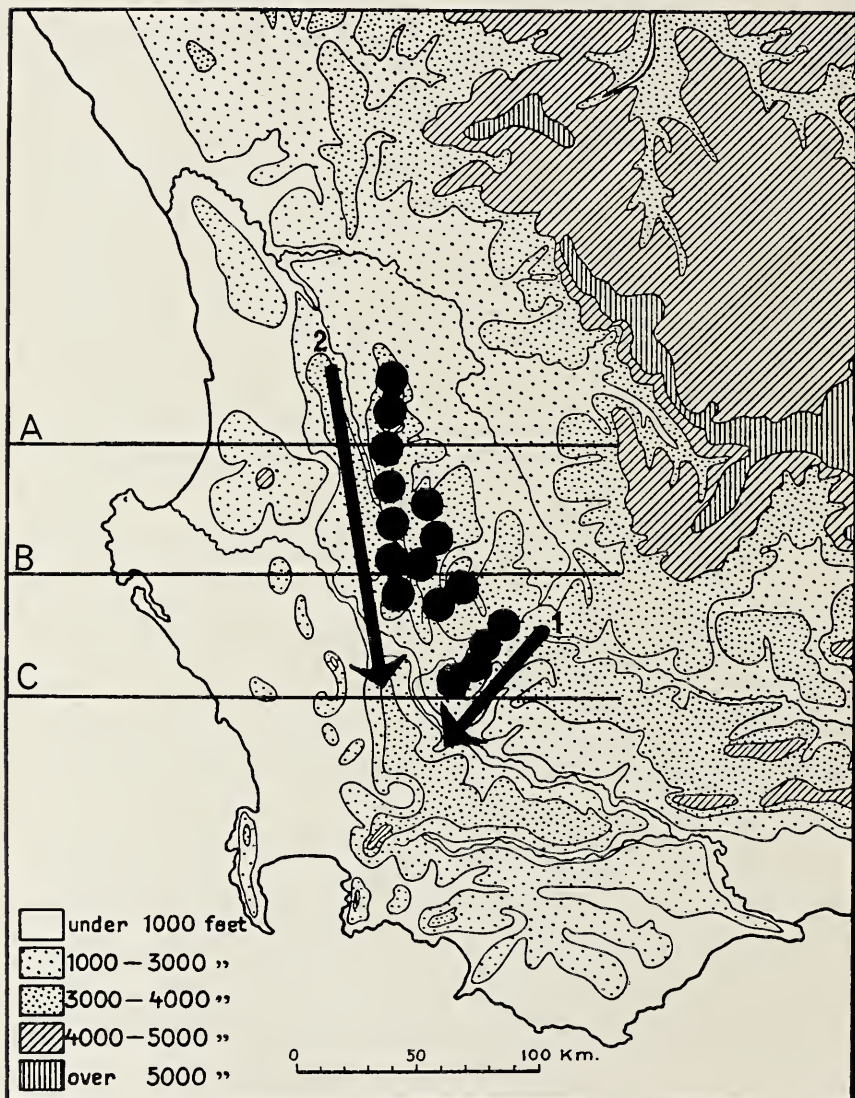
There has been some doubt as to whether *S. phylicoides* Meisn. was described from a mixed collection. Duplicates of one of the syntypes (Zeyher 1468) have been examined in several South African herbaria (BOL, SAM, PRE), and in each case it was found that specimens mounted on sheets numbered Zeyher 1468 belong to two different species. One of these is *S. lanatus* the other is *Spatalla tulbaghensis*. However, it would appear that Meisner did not see a mixed collection of Zeyher 1468 since the material in his own herbarium is of both the collections which he cited and all belongs to the previously described *S. lanatus*. Moreover, the other syntype, *Mund* s.n. in herb. Lindley (CGE) has on examination proved to be *S. lanatus* as well.

Sorocephalus schlechteri Phillips (isotypes in PRE and BOL) is also regarded as being conspecific with *S. lanatus*.

Type Material: South Africa, without precise locality, Thunberg s.n., sheet no. 2934, holotype in herb. Thunberg, Uppsala (UPS). A fragment of the holotype is in the Bolus herbarium (BOL).

Distribution: *S. lanatus* is the commonest and most widespread species in the genus, occurring from the Cedarberg southwards, along the Cold Bokkeveld ranges to Ceres, the Great Winterhoek and Hex River mountains.

Ecology and Biology: Throughout its distribution range *S. lanatus* may be observed on most of the higher peaks. Altitude is apparently an important factor in the distribution of this species for populations are normally only found above 5,000 ft. Apart from altitude, *S. lanatus* does not appear to have any special ecological requirements, since populations are found on a variety of habitats ranging from moist seepage areas to hot, rocky, north facing slopes. Small colonies are often found on exposed buttresses growing wedged between sandstone boulders and sprawling over ledges. In these wind-swept situations the plants tend to develop a prostrate growth habit. Flowering extends over a period of six months, from early spring to late autumn, with a peak in December. The flower colour is usually white or pale pink but a form with very deep pink perianth segments is sometimes encountered.



Map 12. Distribution of *Sorocephalus lanatus* (Thunb.) R.Br. The lines A, B, and C correspond with the axes A, B, and C in fig. 14. The arrows 1 and 2 which indicate increasing leaf length correspond with arrows 1 and 2 in fig. 14.

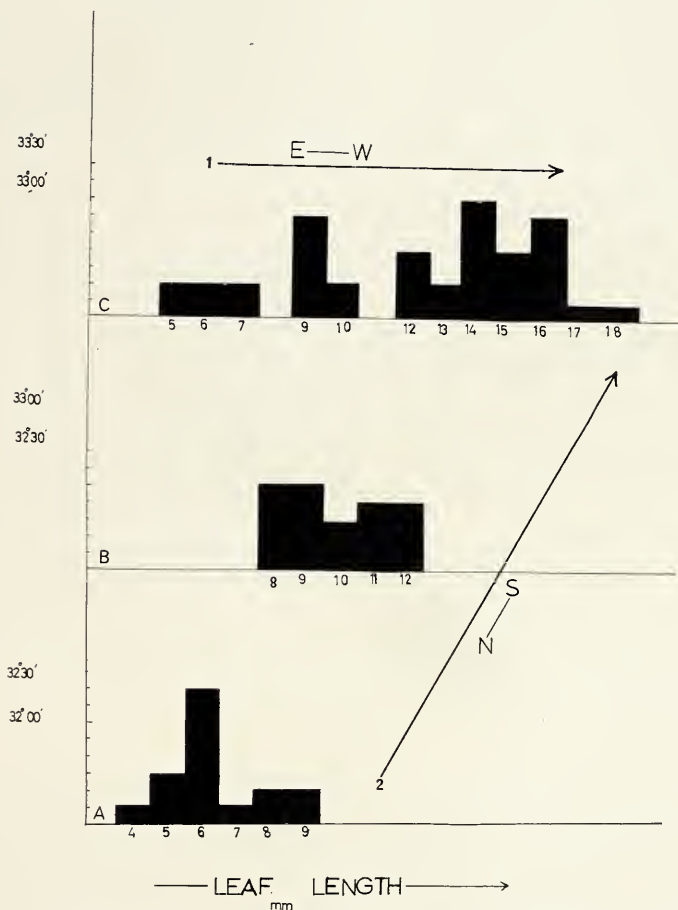


FIG. 14: *Sorocephalus lanatus*. Histograms showing topoclinal variation in leaf length. The axes A, B, and C correspond with the lines A, B, and C on the distribution map (map 12). The arrows 1 and 2 also correspond with 1 and 2 on map 12 and indicate increasing leaf length. Material from the Cedarberg mountains is plotted on (A), from the Cold Bokkeveld on (B) and from the Roodeberg, Hex river, Ceres and Great Winterhoek mountains on (C). On axis (C), the shortest leaves are from the Roodeberg (i.e. the dry Karroo end of the range) and the longest leaves are from the Ceres and Great Winterhoek.

Variation:

(1) Growth habit.

It has been noted above that there is often some variation in growth habit which may be ascribed to differences in the ecological conditions under which the plants are growing. Nevertheless, there is some degree of correlation between growth habit and locality. A very sparsely branched, erect growth habit is typical of plants from localities in the Cedarberg and north Cold Bokkeveld. In the south Cold Bokkeveld and on the Ceres mountains, *S. lanatus* usually develops a dense, more ramified and interlocking branch system.

(2) Leaf length.

There is considerable variation in the leaf length of different populations. After inspecting the full range of available material, it seemed that the forms with the shortest leaves were from northern localities and the longer leaved forms came from more southerly localities. In order to determine the relationship between locality and leaf length, three divisions of latitude were taken, covering the distribution range of the species. Measurements of leaf length were made for all specimens collected in each of the three divisions and from these measurements histograms were prepared. (See fig 14 and map 12.) From the diagram it can be seen that there are two topoclines in leaf length, one from north to south with leaf length increasing southwards, the other from east to west with leaf length increasing westwards. In both cases leaf length appears to be correlated with rainfall. Plants bearing the shortest leaves occur in the Cedarberg, those with the longest leaves are recorded from the high rainfall mountain complex around Ceres and Tulbagh. Likewise for the Roodeberg and Hex River mountains, the shortest leaf lengths are recorded from the drier Karroo end of the range (i.e. the eastern end) and become progressively longer towards the western, wetter end of the range (i.e. Ceres and Tulbagh). Experimental culture is required to ascertain whether these different forms are merely ecological variants or have become genetically stabilised.

(3) Bracts.

The involucre bracts show variability not only in their dimensions but also in pubescence. The outer surface varies from densely lanate through pilose to glabrous. Forms with involucre bracts of different size and pubescence occur at random throughout the distribution range of the species. The presence or absence of pubescence on the involucre bracts was used by Phillips (1912: 702), to distinguish *S. lanatus* and *S. phyllicoides* but present studies show that this distinction is not justified. (See fig. 15.)

(4) Number of flowers per involucre.

The number of flowers per involucre is usually 4, but they are frequently 8 flowered, less frequently 6 and or 9 flowered, rarely 5 or 7 flowered. (See fig 16.)

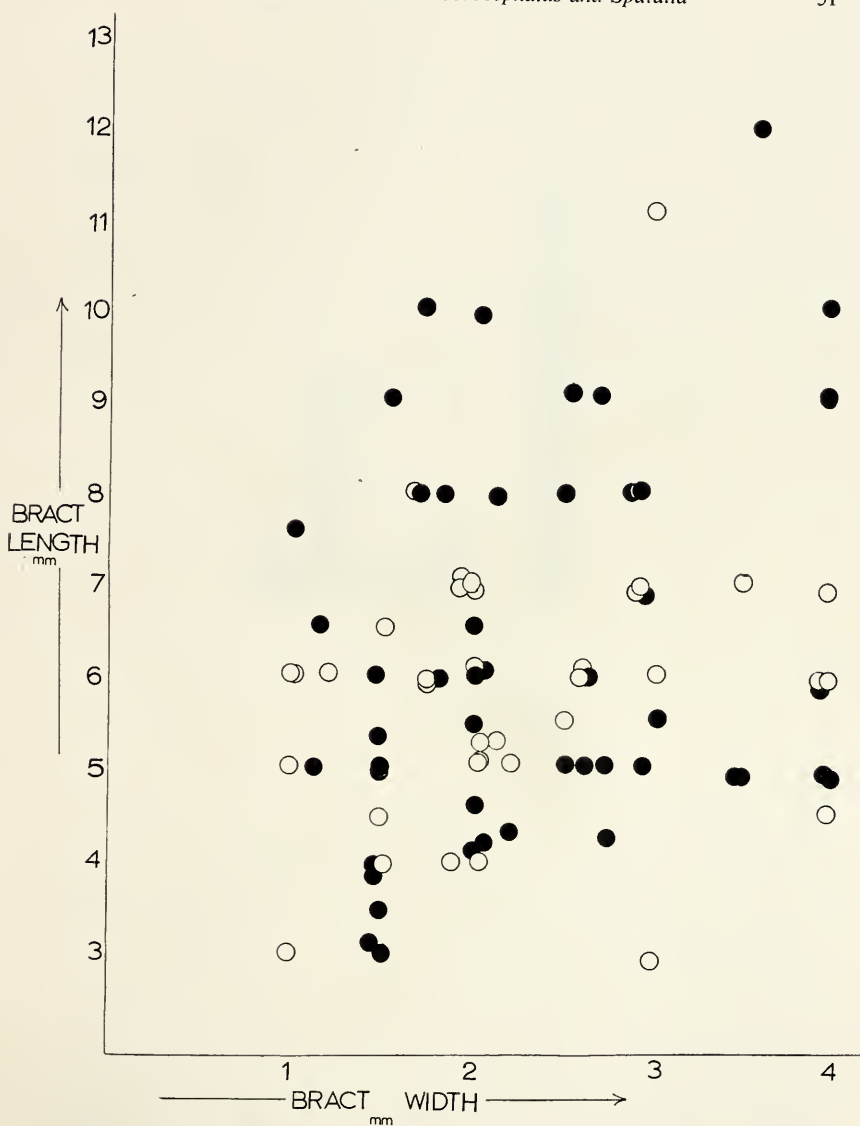


FIG. 15: *Sorocephalus lanatus*. Scatter diagram showing variation in the dimensions on pubescence of the bracts. Open circles = bracts glabrous; blackened circles = bracts pubescent.



FIG. 16: *Sorocephalus lanatus*. Histogram showing the variation in the number of flowers per involucre.

Specimens Examined:

CLANWILLIAM: Apollo, south Cedarberg, *Esterhuysen* 17993 (BOL, PRE); Cedarberg, *Stokoe* 7170 (BOL); Elands Kloof, *Esterhuysen* 3202 (BOL); *Compton* 6682 (NBG); *Compton* 9687 (NBG); Dec., *Compton* 16777 (NBG, PRE); *Lewis* 935 (SAM); *Esterhuysen* 3197 (BOL); *Lewis* 22013 (BOL); *Levyns* 4796 (CT) Elands Kloof, *Levyns* 5141 (CT); Sneeuwberg hut, Cedarberg, Dec., *H. C. Taylor* 6158 (PRE); Cedarhout Kloof, Cedarberg, *Pocock* 333 (PRE); Olifants River mts., *Esterhuysen* 13381 (BOL); Donkerhoek Kop, Cedarberg, *Stokoe* s.n. (SAM 56428); Sneeuwberg, *Barnard* s.n. (SAM 44119); Donker Kloof peak, Clanwilliam, *Stokoe* 9234 (BOL); South side of Sneeuwberg, *Esterhuysen* 13062 (BOL, NBG); Wolfberg, Cedarberg, *Esterhuysen* 22445 (BOL);

CERES: Skurfdeberg, *Bolus* 7563 (BOL); Matroosberg, *Esterhuysen* 28630 (BOL); Skurfdeberg, Jan., *Schlechter* 9990 (BOL, PRE); Hansiesberg, Dec., *Rourke* 20, 24 (BOL); Schurweberg peak, *Esterhuysen* 29436 (BOL); Conical peak, *Stokoe* 8052 (BOL); Matroosberg, *A. Bolus* 4425 (BOL); Gydoberg, Jan., *Schlechter* 10230 (BOL, PRE); Matroosberg, *Marloth* 2227 (BOL); Baviaansberg, *Stokoe* 4521 (BOL); Gydoberg, *Leighton* 2233 (BOL, PRE); South Cold Bokkeveld, *Bond* 652 (NBG); Witzenberg Vlakte, Nov., *Compton* 12467 (NBG, PRE); Baviaansberg, *Bond* 1453 (NBG); Roodeberg, *Compton* 8399 (NBG); Zandfontein peak, *Compton* 19436 (NBG); Gydo, Ceres, Nov., *Compton* 18744 (NBG); *Compton* 18724 (NBG); Baviaansberg, *Stokoe* s.n. (SAM 52719); Matroosberg, *Davidson* 37 (SAM); Hansiesberg, *Lewis* 883 (SAM); Hex River mts., *Davidson* 9 (SAM); Matroosberg *Phillips* 11923 (SAM); Hexberg, *Thorne* s.n. (SAM 52030); Skeldeberg plateau, *Stokoe*

s.n. (SAM 49845); Visgat, between Skurfsdeberg and Great Winterhoek *Stokoe* s.n. (SAM 63177); Skurfsdeberg range, *Esterhuysen* 26414 (BOL); North slopes of the Hex River mts., *Esterhuysen* 24055 (BOL); Mitchells Pass, *Eyre* 25·8 (CT); Peak east of Tarantula peak, Oct., *Esterhuysen* 21817 (BOL, PRE); Neethlingsberg, *Esterhuysen* 22526 (BOL); Hexberg, Cold Bokkeveld, *Esterhuysen* 18425 (BOL); Zandberg, Cold Bokkeveld, *Esterhuysen* 3452 (BOL); Schurweberg, *Esterhuysen* 20658 (BOL); Roodeberg, Hex River mts., Oct., *Andreae* 1145 (PRE); Ceres mts., near village, Sept., *Marloth* 6159 (PRE); Gideons Kop, south Cedarberg, Oct., *Rourke* 667 (NBG); *Esterhuysen* 13880 (BOL); Gideons Kop, *Stokoe* s.n. (SAM 54641a).

TULBAGH: Below Great Winterhoek, Phillips 1838 (SAM); Swartgat, Witzenberg, *Esterhuysen* 27932 (BOL); Great Winterhoek, *Esterhuysen* 28519 (BOL); North Sneeuwgat peak, *Esterhuysen* 19806 (BOL); Witzenberg Vlake *Isaac* s.n. (BOL); Winterhoek peak, Jan., *Andreae* 1099 (STE, PRE); Summit of Witzenberg, *Andreae* 149 (STE). Witzenberg vlakte, *Zeyher* 1468 (partly) (PRE, SAM, BOL, NY); Near Tulbagh, *Dr. Pappe*, s.n. (K).

WORCESTER: Valsch Gat Kloof, *Esterhuysen* 1554 (BOL); South slopes of Milner peak, 14256 (BOL); Milner peak, *Esterhuysen* 28100a (BOL); Hex River mts., *Esterhuysen* 9396 (BOL); Below Milner peak, *Esterhuysen* 14932 (BOL); Buffelshoek peak, *Esterhuysen* 8422 (BOL); Waaihoek mts., *Esterhuysen* 15108 (BOL).

LOCALITY UNCERTAIN: Swartland Oct., anno 1799, *Roxburgh* 9 (K,G); No locality, sheet 2934 in herb. *Thunberg* (UPS); E cap. b. spei, *Ekeberg* in herb. Bergius (SBT); Cap. b. spei *Thunberg* anno 1775, in herb. Montin (S).

(11) *Sorocephalus tenuifolius* R.BR. in Trans. Linn. Soc. Lond. **10**: 141 (1810).

Sorantho tenuifolia Salisb. ex Knight in Knight, Cult. Prot. 72 (1809).

Protea tenuifolia (R.Br.) Poir. in Lam. Encycl. Meth. Bot. Suppl. 4: 577 (1816).

An erect well branched shrublet, 0·5—1 m tall. *Branches* slender, terete, covered with densely imbricate leaves. *Leaves* linear, semi-terete flattened on the upper surface, apiculate, 1 cm long, pilose when young, soon glabrous. *Inflorescence* terminal, globose, 1·5 cm in length and diameter, composed of 4—5 involucre. *Bract* subtending the involucre very narrowly lanceolate attenuate, terete at apex, pilose, 10 mm long. *Involucre* 4 flowered. *Bracteoles* narrowly ovate to lanceolate, 5 mm long, villous. *Perianth* 12 mm long, perianth claws densely woolly, narrow, spreading. *Perianth limbs* narrowly elliptic, densely bearded with long straight hairs. *Perianth tube* 2 mm long, glabrous, slightly inflated at the base, narrowing towards junction with perianth claws. *Anthers* sessile, elliptic, apical boss pointed, black. *Style* filiform, 10 mm long, terminated by a very narrowly ellipsoid pollen presenter. *Ovary* ellipsoid, densely hirsute, 1 mm long. *Hypogynous scales* minute, 0·5 mm long, linear subulate. *Fruits* 5—6 mm long, truncate and pedicellate at the base, hirsute, but less densely hirsute towards the base.

Diagnosis: The hirsute fruits, truncate and pedicellate at the base, distinguish this species from all others in the genus. The small globose inflorescence composed of only four to five, four flowered involucre subtended by a lanceolate attenuate bract, are further diagnostic characters.

The type of *Sorocephalus tenuifolius* was collected by Niven "in moist parts of the mountains near Breed river", and was described as *Soranthé tenuifolia* by Knight (1809). One year later the same collection was described as *Sorocephalus tenuifolius* by Brown. Both authors remark that this species resembles *Spatalla prolifera* so closely as to be easily mistaken for that plant. (The specimens in the Bolus herbarium had in fact been incorrectly identified as *Spatalla prolifera*.)

Despite the fact that *S. tenuifolius* is probably the rarest and least perfectly known species in the genus, there is good evidence to prove that it was cultivated in England at some stage, for Knight (1809) records that it was "raised at Clapham in 1802". Moreover, there is a fine specimen in the Kew herbarium labelled in R. A. Salisbury's handwriting as coming from "Hibbert's garden, June 1806".

Only three collections have been made since Niven's. They are, *Krauss* 1061 "in solo lapidoso prope Elim", and two records from the Palmiet River valley by Stokoe. (I have not been able to examine the *Krauss* specimen personally.) We have no information about the habitat of this species, or its ecological requirements. The flowering period is from January to February.



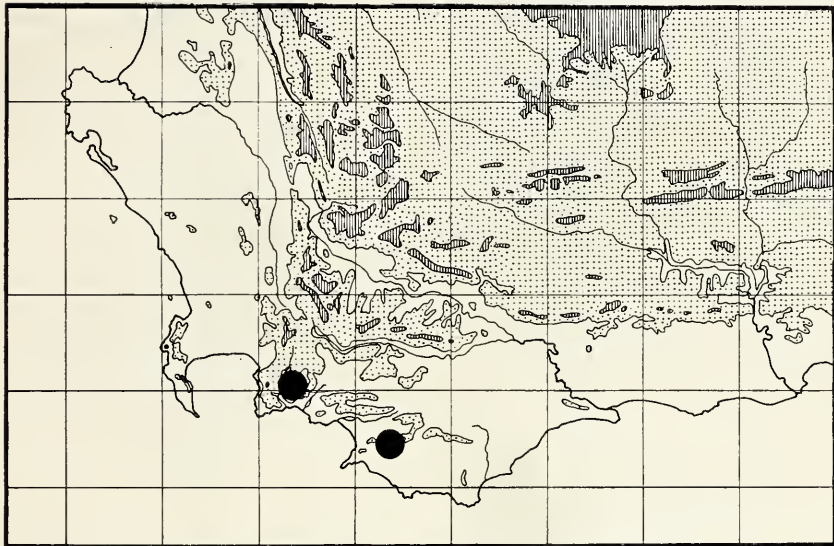
FIG. 17: *Sorocephalus tenuifolius*. (1) Involucre with subtending bract ($\times 4$) (2) single flower ($\times 8$) (3) fruit ($\times 6$).

Type Material: "Moist parts of the mountains near the Breed River", e coll. Hibbert, Niven, holotype (BM).

Specimens Examined:

CALEDON: Palmiet River valley, Elgin, Feb., *Stokoe* 8591 (BOL, SAM); Palmiet River valley, Grabouw, Jan., *Stokoe* s.n. (SAM, NBG, PRE).

EXACT LOCALITY UNCERTAIN: "Slender plant, alpine moist places near Breede River, Niven 20 (K); Without collector or locality, Hibbert's garden, June 1806 (K).



Map 13. Distribution of *Sorocephalus tenuifolius* R.Br.

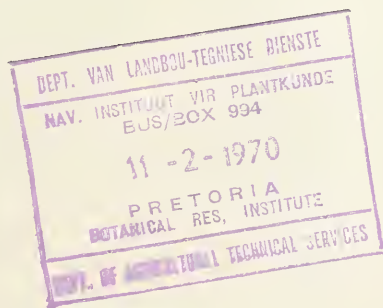




FIG. 18: Representative examples from the two sections of the genus *Spatalla*. (1) Inflorescence of *Spatalla curvifolia* with one flowered involucre ($\times 2$) (2) *S. curvifolia*, a lateral view of a single flowered involucre ($\times 8$) (3) *Spatalla incurva*, an inflorescence with three flowered involucre ($\times 2$) (4) *S. incurva*, anterior view of a three flowered involucre ($\times 7$).

A REVISION OF SPATALLA SALISB.

Spatalla Salisb. in Parad. Lond. opp. tab. 67 (1807).

Spatallopsis Phillips, in Kew Bull. **1910** : 286 (1910).

Small shrubs, erect, semi-erect, or sprawling, to 1·5 m tall, sometimes forming mats 1 m in diam. *Branches* terete, erect or decumbent, pubescent or glabrous. *Leaves* acicular-terete, acicular-terete with a canaliculate upper surface, or linear with a concave to flattish upper surface, apex usually mucronate. Leaves glabrous or sparsely to densely sericeous. *Inflorescence* cylindric, rarely globose to ovoid, terminal, sessile or pedunculate, single, or with up to six lateral inflorescences arising around it. *Bracts* ovate to lanceolate or acicular-terete. *Involucres* 3 flowered or 1 flowered, sessile or pedicellate, composed of 4 variously fused bracteoles. Bracteoles free or fused into an anticus lip with a free posticus lip, often fused into a tightly clasping calycoid involucre, glabrous or sericeous to villous. *Perianth* always curved forward in bud.

Perianth segments equally developed, or with the posticus segment erect and larger than the three anticus segments and the posticus perianth limb galeate. *Perianth tube* 1—5 mm long, glabrous or pubescent. *Anthers* sessile, ovate to elliptic, 1 mm long with a rounded or pointed, black to yellow apical boss. *Style* terete 7—14 mm long curved forward in the apical region. *Pollen presenter* obliquely placed on the apex of the style, curved forward, ovoid, obovoid, or a flattened cochleariform disc, stigmatic groove central, often a minute papilla. *Ovary* ovoid, 1 mm long, pubescent or glabrous, style arising from ovary in a central or oblique position. *Hypogynous scales* 4, subulate linear, 1—1·5 mm long, pale yellow or hyaline. *Fruits* cylindric to ovoid, pubescent, truncate and variously pedicellate at the base.

Diagnosis: The diagnostic features of the genus *Spatalla* are: the 3 or 1 flowered involucres, the perianth which is always curved abaxially in the bud stages or may be zygomorphic, and the usually pubescent cylindric fruits with a truncate and pedicellate basal region.

Etymology: Formed from the Greek “spatale”, meaning “wantoneſs”, the name is apparently an allusion to the prominent pollen presenter, which is unusually large for such a small flower. Loudon (1829), remarks rather coldly that the name had been “formed by Mr. Salisbury with more wit than decency on account of its ample stigma”.

Type: *Spatalla racemosa* (L.) Druce.

Distribution: South Africa; South Western and Southern Cape Province.

The genus is divided into two sections.

Section 1. *Cyrtostigma* Endlicher.

Involucres three flowered.

S. tulbaghensis; *S. caudata*; *S. confusa*; *S. thyrsiflora*; *S. incurva*; *S. argentea*; *S. propinqua*.

Section 2. *Spatalla*.

Involucres one flowered.

S. salsoloides; *S. setacea*; *S. nubicola*; *S. parilis*; *S. barbiger*; *S. colorata*; *S. prolifera*; *S. squamata*; *S. ericoides*; *S. longifolia*; *S. curvifolia*; *S. racemosa*; *S. mollis*.

KEY TO THE GENUS SPATALLA

- 1 Involucres 3 flowered.
 - 2 Inflorescence globose, almost spherical 1. *tulbaghensis*
 - 2 Inflorescence spicate, cylindric.
 - 3 Median anticus bracteole subtending a forked shoot . . . 4. *thyrsiflora*
 - 3 Median anticus bracteole barren, or subtending a small mound of undifferentiated tissue or a simple vegetative shoot.
 - 4 Pollen presenter a flattened, obliquely obovate cochleariform disc.
 - 5 Leaves densely and permanently silvery sericeous, fruits sericeous 6. *argentea*
 - 5 Leaves very thinly sericeous at first, rapidly becoming glabrous, fruits glabrescent 7. *propinqua*
 - 4 Pollen presenter obovoid or conic ovoid, subterminal region of style bent forwards almost at right angles.
 - 6 Leaves linear, semi-terete, concave or slightly canaliculate on the upper surface, apex blunt and rounded.
 - 7 Leaves glabrous, bracts and bracteoles glabrous, inflorescence short (1—1.5 cm), perianth limbs sericeous, stems prostrate, sprawling 3. *confusa*
 - 7 Leaves pubescent (at least on the upper surface), bracts and bracteoles pubescent, inflorescence long (2—6 cm), perianth limbs densely lanate, stems straight and erect 2. *caudata*
 - 6 Leaves completely terete, acicular, not canaliculate or grooved on the upper surface, apex sharply mucronate 5. *incurva*
 - 1 Involucres 1 flowered.
 - 8 Pollen presenter ellipsoid cylindric or ovoid to capitate, perianth segments equally developed.
 - 9 Inflorescence globose, perianth inflated at the base 9. *setacea*
 - 9 Inflorescence cylindric, perianth cylindric, not inflated at the base.
 - 10 Pollen presenter ovoid to capitate, leaves straight, ascending 10. *nubicola*
 - 10 Pollen presenter ellipsoid cylindric, junction of style and pollen presenter geniculate, leaves incurved 8. *salsoloides*

- 8 Pollen presenter an oblique, obovate, cochleariform disc, posticous perianth segment distinctly galeate, larger than the three anticus segments.
- 11 Inflorescence sessile, leaves terete but not canaliculate.
- 12 Style pubescent in the lower third, involucre composed of 3 bracteoles, 1 posticous, 2 anticus 20. *mollis*
- 12 Style completely glabrous, involucre composed of 4 bracteoles, 1 posticous, 3 anticus.
- 13 Involucres sessile.
- 14 Bracteoles free, narrowly linear lanceolate, inner surface of the perianth claws glabrous 14. *prolifera*
- 14 Bracteoles fused to form a prominent calycoid involucre, inner surface of the perianth claws thickly villous.
- 15 Bracteoles glabrous 15. *squamata*
- 15 Bracteoles pubescent 16. *ericoides*
- 13 Involucres pedicellate, pedicel 1—3 mm long.
- 16 Bracteoles of the anticus lip of the involucre fused in their lower third, lanceolate acute.
- 17 Bracteoles glabrous (margins ciliate), leaves glabrous to very sparsely pilose 13. *colorata*
- 17 Bracteoles sericeous, leaves silvery sericeous 12. *barbifera*
- 16 Bracteoles free or fused at base only, linear to narrowly lanceolate acuminate 11. *parilis*
- 11 Inflorescence pedunculate, peduncle 1—7 cm long, leaves terete, canaliculate on the upper surface.
- 18 Bracteoles of the lower lip of the involucre lanceolate acute, fused at the base only 17. *longifolia*
- 18 Bracteoles of the lower lip of the involucre almost completely fused, lower lip scarcely trifid.
- 19 Inflorescence a lax raceme, 1—3 cm long, bracts subtending involucres subulate, 1—2 mm long 19. *racemosa*
- 19 Inflorescence a dense cylindric raceme, 4—7 cm long, bracts subtending the involucres acicular filiform, 5—8 mm long 18. *curvifolia*

(1) *Spatalla tulbaghensis* (Phillips) Rourke, comb. nov.*Sorocephalus tulbaghensis* Phillips in Kew Bull. 1911 : 86 (1911) basionym.

A low, much branched, rounded shrub to 0.5 m tall. *Branches* slender, terete, erect, thickly villous. *Leaves* linear, semi-terete, flattened or slightly concave on the upper surface, 8—15 mm long, ascending to spreading, margins long ciliate. *Inflorescence* globose, almost spherical, 1—2 cm in diam., sessile to subsessile, single and terminal or with up to 6 inflorescences arising laterally at the apex of a flowering shoot. *Bracts* ovate to broadly lanceolate, glabrous to sericeous, margins ciliate, 2—3 mm long. *Involucres* 3 flowered, subsessile to pedicellate, pedicel 1 mm long. Bracteoles free, 5 mm long 1.5 mm broad, lanceolate acute to broadly lanceolate, sericeous, margins ciliate; median anticus bracteole with infolded margins, subtending a minute stump of tissue, or barren. *Perianth* 10 mm long, curved forward in bud, perianth segments equal. *Perianth limbs* ovate 1 mm long, lanate. *Perianth claws* recurved on open-

ing, thickly villous. *Perianth tube* 5 mm long, glabrous, somewhat quadrangular, slightly swollen at the base. *Anthers* ovate 1 mm long, apical boss rounded, black. *Style* 7—8 mm long straight but curved forwards at the apex. *Pollen presenter* conic oblong obliquely curved forwards. *Ovary* ovoid ellipsoid, densely sericeous, 1 mm long. *Hypogynous scales* linear subulate, slender, 2 mm long. *Fruits* cylindric ovoid, sericeous, 4 mm long 2 mm in diam., truncate and broadly pedicellate at the base.

Diagnosis: *S. tulbaghensis* is easily distinguished from all other species of *Spatalla* with three flowered involucre by its globose almost spherical inflorescences and its dense, compact, much branched growth habit.



FIG. 19: *Spatalla tulbaghensis*. (1) Involucre with three flowers, the anticous bracteole drawn forwards to show the small mound of tissue at its base ($\times 10$) (2) fruit (3) apex of style and pollen presenter.

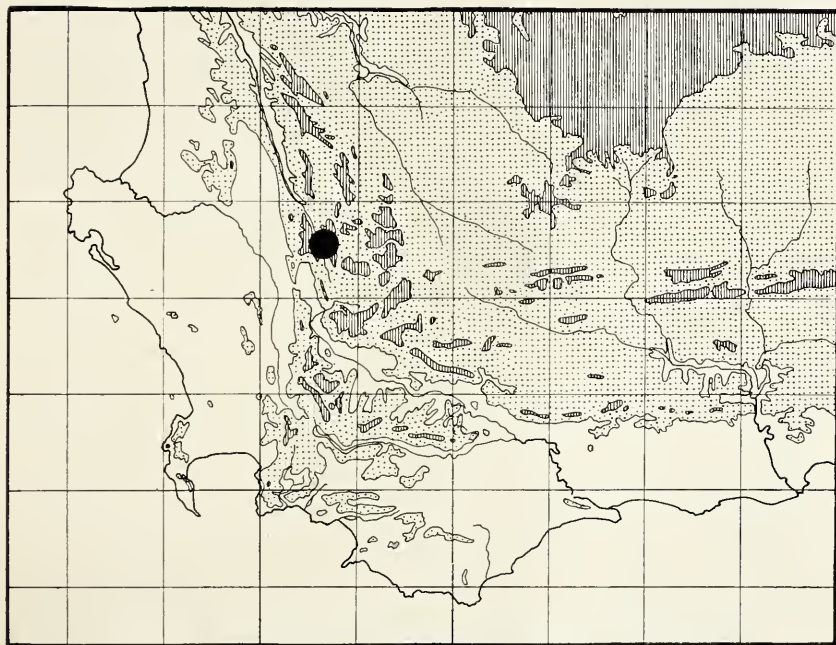
Type Material: "Near Tulbagh, Cape of Good Hope, *Dr. Pappe*", holotype in Kew herbarium (K).

Distribution: This very local species is known only from the Agter Witsenberg Vlake and the Schurftteberg Pass.

Ecology and Biology: *S. tulbaghensis* grows in fairly dense stands on flats of deep, coarse, sandy soil, always in moist situations. The area in which the plants grow is very wet in winter with pools of water collecting on the surface, while in summer a high-water table is maintained by the continuous percolation of water to the surface through the coarse, gritty soil. Flowering takes place from September to early December.

Specimens Examined:

CERES: Witsenberg Vlake, *Zeyher* 1468 (partly) (PRE, BOL, SAM); Die Vlake, Oct., *M. Walgate* 396 (NBG); Witsenberg Vlake, Nov., *Leighton* 2297 (PRE, BOL); Schurftteberg Pass, Oct., *Compton* 16228 (NBG, BOL); Witsenberg Vlake, Sept., *Compton* 21012 (NBG); Nov., *Compton* 18817, 18818 (NBG); Schurftteberg Pass, Dec., *Compton* 16809 (NBG); Agter Witsenberg Vlake, Oct., *Rourke* 649 (NBG); Welgemeend farm on the Agter Witsenberg Vlake, *Rourke* 957 (NBG).



Map 14. Distribution of *Spatalla tulbaghensis* (Phillips) Rourke.

(2) ***Spatalla caudata*** (Thunb.) R.Br. in Trans. Linn. Soc. Lond. **10** : 150 (1810).

Protea caudata Thunb., Diss. Prot. : 26, tab. 2 (1781).

Spatalla caudaeiflora Salisb. ex Knight in Knight, Cult. Prot. : 75 (1809) Nom. illegit.

Spatalla ericaefolia Salisb. ex Knight in Knight, Cult. Prot. : 74 (1809).

Spatalla brevifolia R.Br. in Trans. Linn. Soc. Lond. **10** : 151 (1810).

Spatalla thunbergii R.Br. in Trans. Linn. Soc. Lond. **10** : 150 (1810).

Protea australis Poir. in Lam. Encycl. Meth. Bot. Supp. **4** : 579 (1816) Nom. illegit.

Spatalopsis caudata (Thunb.) Phillips in Kew Bull. **1910** : 288 (1910).

Spatalopsis ericaefolia (Salisb. ex Knight) Phillips in Kew Bull. (**1910** : 288 (1910).

Spatalopsis caudaeiflora (Salisb. ex Knight) Phillips in Kew Bull. **1910** : 289 (1910).

An erect shrub to 1 m tall, with a stout main stem. *Branches* very straight erect, reddish and glabrous. *Leaves* linear, 8—18 mm long, semi-terete, concave on the upper surface, sparsely sericeous, at least on the upper surface. Inflorescence terminal, sessile, often with 2 or 3 lateral inflorescences developing below it later; a cylindric raceme up to 7 cm long, usually 5—6 cm long. *Bracts* narrowly lanceolate, acute to acuminate, 6 mm long, sericeous to glabrous. *Involucres* 3 flowered, subsessile to pedicellate, pedicel 1 mm long. Bracteoles free, upper 3 bracteoles lanceolate acute, villous, 5 mm long, the median anticus bracteole narrowly lanceolate linear, villous, 5 mm long, flattened in the vertical plane by the inward folding of the margins. *Perianth* 10 mm long, carmine in colour when fresh, curved in bud. *Perianth limbs* broadly elliptic, of equal size, lanate, curved at right angles to the perianth claws. *Perianth claws* 8 mm long, outer surface villous. *Perianth tube* 4—5 mm long, quadrangular, glabrous, but slightly villous at the top. *Style* filiform, 8 mm long, curved forwards at right angles in the apical region. *Pollen presenter* obliquely conic ovoid. *Hypogynous scales* linear, 1 mm long pale yellow. *Ovary* ovoid, 1 mm long, pilose. *Fruits* cylindric ovoid, 5 mm long, 1—2 mm broad, sericeous, truncate and broadly pedicellate at the base, apex beaked.

Diagnosis: The most important diagnostic features of *S. caudata* are: the erect bushy habit of growth, with long erect, straight stems, the permanent pubescence of the leaves, or at least of the upper surface of the leaves, the long cylindric inflorescences (5—7 cm), and the densely lanate to villous perianth.

Thunberg made the first recorded collection of this species, presumably in the Cold Bokkeveld when he crossed that part of the country in the company

of Masson during the spring of 1773. He gives a good illustration of this species in his "Dissertatio De Protea" (1781) which clearly shows the long cylindric inflorescence, so typical of *S. caudata*.

After having examined the types of *S. thunbergii* R.Br. and *S. brevifolia* R.Br. at the British Museum and the type of *S. ericaefolia* Salisb. ex Knight at Kew, I am satisfied that these three taxa are synonymous with *S. caudata* (Thunb.) R.Br.

Type Material: South Africa, without precise locality, *Thunberg*, in herb. Thunberg, sheet 2892 (UPS).

Distribution: The distribution range extends from the Cedarberg southwards through the Cold Bokkeveld to Tulbagh, and eastwards to the Bokke River flats and Verkerde vlei.

Ecology and Biology: *S. caudata* shows a marked preference for deep sandy soils derived from Table Mountain sandstone. It is frequently encountered along stream sides and the margins of seepage areas on sandy flats where the soil is coarse and gritty and the drainage good. Fairly dense but local stands occur and are very attractive when the silvery-pink inflorescences appear in September and October. The perianth is pink to pale carmine in colour, but occasionally an albino with cream to white perianth segments appears.

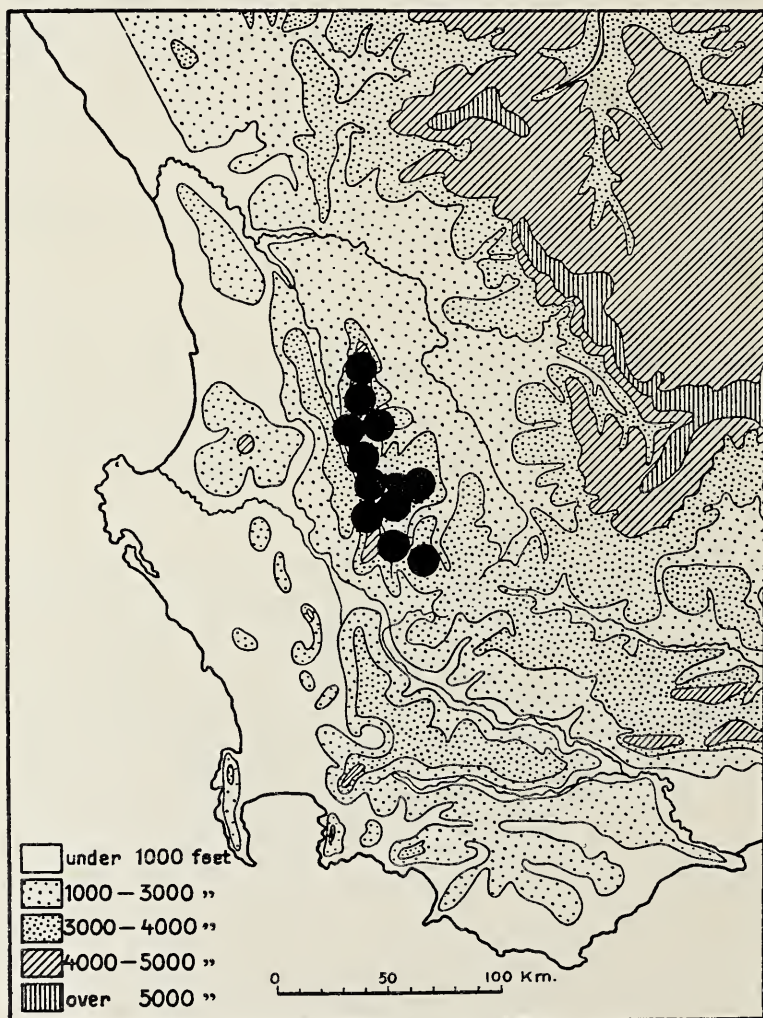
Specimens Examined:

CLANWILLIAM: Sneeuwberg, Cedarberg, Oct., *Pocock* 396 (STE); Pakhuis, Klein Kliphuis, March, *Hardy* 1639 (PRE); Citrusdal, Dec., *Hardy* 1927 (PRE); Ezelbank, Sept., *Schlechter* 8838 (PRE); Cedarberg, Nov., *Stokoe* 8058 (BOL, SAM); Elands Kloof sand flats, Sept., *Compton* 16195 (NBG, PRE); Wabooms River, Sept., *Compton* 6683 (NBG); Wabooms River flats, Sept., *Compton* 6685 (NBG, BOL); Elands Kloof Pass, *H. Wood* s.n. (NBG); Zwartberg, *Niven* (K); Between Groot River and Elands Kloof, Oct., *Leipoldt* 3513 (BOL); Mountains north of the Olifants River, April, *Leipoldt* s.n. (BOL).

CERES: 15 miles south of Middleberg, Leeu River flats, Oct., *Acocks* 19870 (PRE); Cold Bokkeveld, south of Citrusdal, Oct., *Story* 3008 (PRE); Ertjieskraal Kloof, Sept., *Compton* 16091 (NBG, PRE); Schoongesicht, Cold Bokkeveld, Jan., *Schlechter* 10180 (BOL, PRE); Bokke River flats, Sept., *Levyns* 932 (CT); Grootgontein- Zwartuggens, *Levyns* 1864 (CT); Houdenbek flats, Cold Bokkeveld, Sept., *Levyns* 1947 (CT); Gideons Kop, Nov., *Stokoe* s.n. (SAM 54495); Leeuwivier, Cold Bokkeveld, Dec., *Lewis* 936 (SAM); Schoongezicht, April, *Stokoe* s.n. (SAM 66198); Between Schoongezicht and Kransvogelfontein, N.W. Cold Bokkeveld, Jan. *D. H. Woods* s.n. (SAM 66197); Near Sandberg, South Cold Bokkeveld, Oct., *Compton* 10027 (NBG); North Cold Bokkeveld, Oct., *Bond* 642 (NBG); Gydo, Ceres, Nov., *Compton* 18753 (NBG); Riet Vlei farm, *L. E. Taylor* 5813 (NBG); Rosendal, Sept., *Compton* 5034 (NBG); Sept., *Compton* 5014 (NBG); Sept., *Compton* 5015 (NBG, PRE); De Keur, Sept., *Compton* 6684 (NBG); Cold Bokkeveld, Sept., *Rycroft* 2536 (NBG); South Cold Bokkeveld, Oct., *Esterhuysen* 5095 (BOL); North Cold Bokkeveld, Oct., *Esterhuysen* 3482 (BOL); Gydoberg, Nov., *Leighton* 2203 (BOL); Gydoberg, Jan., *Schlechter* 10225 (BOL); Baviansberg, Jan., *Stokoe* 4531 (BOL); Elands Kloof, Sept., *Compton* 16195 (BOL); South Cold Bokkeveld near Sandberg, Oct., *Esterhuysen* 3450 (BOL); Near De Keur, Oct., *Leipoldt* 3060 (BOL); Verhoode valley, wet sandy places, *Niven* 41 (K); Gydoberg, Nov., *Leighton* 2206, 2238 (BOL); Wagenbooms River, Cold Bokkeveld, Aug., *Rourke* 560 (NBG); Boboskloof, South Cold Bokkeveld, Oct., *Rourke* 656 (NBG).

TULBAGH: Near Tulbagh, *Pappe* s.n. (PRE).

WITHOUT PRECISE LOCALITY: Prom bon spei, *Masson* (G); Cap b. spei, *Thunberg* in herb. Bergius (SBT); E cap b. spei, *Masson* in herb. Thunberg, sheet 2893 (UPS); Cap b. spei, *Thunberg* sheet 2892 (UPS); Africa australis, *Mr. Masson* (BM); Africa australis, *Niven* (BM); Palmitte River, *Masson* (BM)—this is an incorrect locality.



Map 15. Distribution of *Spatalla caudata* (Thunb.) R.Br.

(3) *Spatalla confusa* (Phillips) Rourke, comb. nov.

Spatallopsis confusa Phillips in Kew Bull. 1910 : 289 (1910).

A low spreading, decumbent to sub-erect shrub, 0·5—1 m tall, forming large mats 1—1·5 m in diam. *Branches* quite glabrous, bark reddish. *Leaves* 6—14 mm long, linear, semi-terete, bluntly mucronate, slightly flattened to concave or channelled on the upper surface, glabrous, but occasionally pilose when young, bright green and reddish tinted in live state. *Inflorescence* a rather lax, sessile to subsessile terminal cylindric raceme, 1—2·5 cm long, 1 cm wide. *Bracts* lanceolate, acute to acuminate, 3—4 mm long, glabrous. *Involucres* three-flowered, pedicellate, pedicel 1 mm long. *Bracteoles* free, lanceolate to narrowly lanceolate, acute to acuminate, clasping the perianth at the base, somewhat naviculiform, 4—7 mm long, glabrous. Median anticus bracteole barren. *Perianth* 8 mm long, strongly curved forward in the limb region when in bud. *Perianth limbs* equal, 1 mm long, elliptic, thickly sericeous. *Perianth claws* narrow, outer surface sparsely sericeous, inner surface long sericeous at the base. *Perianth tube* 4—5 mm long, slightly quadrangular, glabrous but very sparsely sericeous at the top. *Anthers* sessile, elliptic, 1 mm long, apical boss ovoid, black. *Style* arising obliquely from the posterior portion of the ovary, straight but curved forwards at right angles in the subterminal region, 6—7 mm long. Pollen presenter obliquely conic ovoid, stigmatic groove terminal. *Ovary* ovoid, thinly sericeous, 1 mm long. *Hypogynous scales* subulate, 1·5 mm long, white. *Fruits* cylindric—obtuse, truncate and pedicellate at the base, villous, 4 mm long.

Diagnosis: Among the species of *Spatalla* with three-flowered involucre, *S. confusa* is distinguished by the long perianth tube (4—5 mm), the sparsely sericeous perianth claws, the rather short inflorescence (1—2·5 cm), the glabrous branchlets and leaves, the glabrous bracts and bracteoles and the sprawling growth habit.

Few species could have been more aptly named than this one. When Phillips described *Spatallopsis confusa* in 1910, five syntypes were cited and among the four iso-syntypes which I have been able to examine, two different species are represented. Thus the three Schlechter specimens, Schlechter 10180, Schoongezigt (PRE); Schlechter 10225, Gydowberg (BOL); and Schlechter 8838, Ezelbank (BOL, PRE), are all *Spatalla caudata* (Thunb.) R. Br. The only iso-syntype which matches the type description is Bolus 11627. The leaves and bracts are described as being glabrous, two distinctive features of Bolus 11627 and since this is the only element cited which is in agreement with the type description, the epithet "confusa" must be applied to this collection. There is no indication

that Phillips examined this collection in the Bolus herbarium, rather it is more probable that a duplicate at Kew was used and accordingly the Kew specimen has been selected as the lectotype.

Type Material: Among rocks near the summit of the Swartberg Pass, Dec., *Bolus* 11627, lectotype in the herbarium of the Royal Botanic Gardens, Kew, isolectotype in Bolus herbarium.

Distribution: *S. confusa* has the widest distribution range in the genus, occurring from the Cedarberg in the north west to Mannetjesberg in the Uniondale district. The apparent absence of this species from the Langeberg and Outeniqua ranges is puzzling for there are many peaks in the coastal ranges of a suitable altitude to harbour *S. confusa*. This may be due to inadequate collecting but such a suggestion is hardly tenable as the Langeberg—Outeniqua area is just as well known botanically as the Swartberg. The eastward extension thus takes place entirely along the Witteberg, Swartberg and Kamanassie ranges. No other species extends as far east as *S. confusa*.

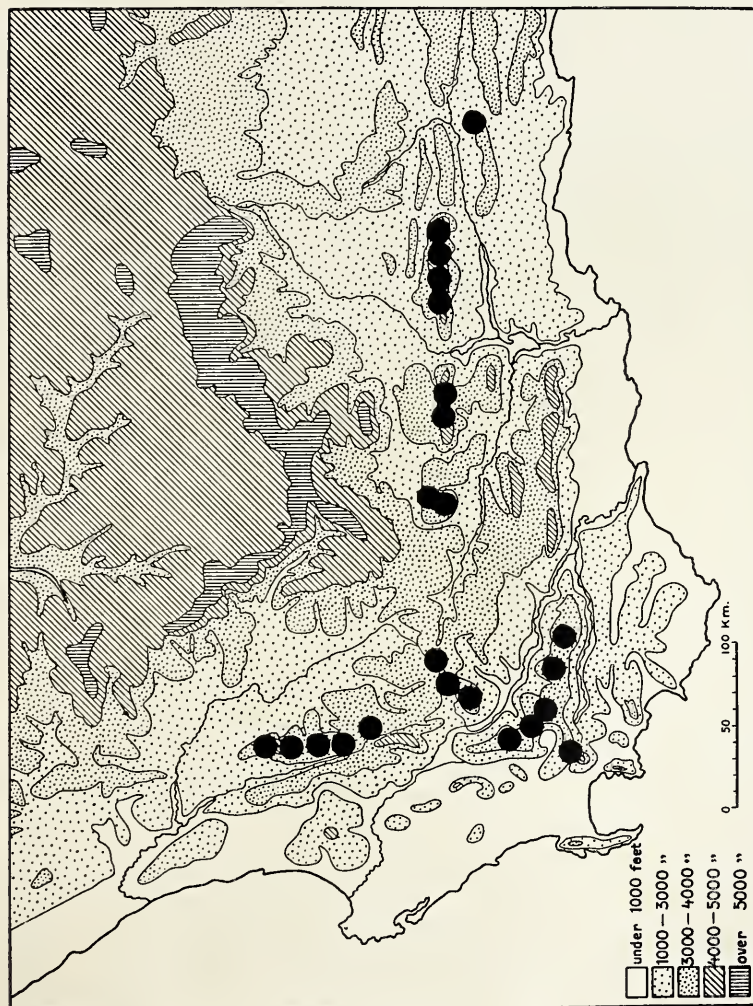
Ecology and Biology: This species is generally a low decumbent plant forming large mats, often over 3 ft. in diameter. It is found rooted in rock crevices and sprawling over large Table Mountain sandstone boulders, sometimes growing in large but local stands. It usually occurs only at the summits of very high peaks and has been recorded between 4,000 ft. and 7,000 ft., but mainly at 5,000—6,000 ft. Here *S. confusa* endures very harsh growing conditions with intense heat in summer and severe cold in winter when the plants are frequently buried by falls of snow. In these exposed positions high winds and intense insolation are experienced almost throughout the year which cause the plants to develop a low, clipped and matted growth habit. The foliage of plants growing in north facing situations is always tinted brilliant carmine. The erect and more luxuriant growth habit of certain populations of this species on the Hottentots Holland mountains can probably be ascribed to the moistness of their environment. The flowering period is brief, from November to December.

Specimens Examined:

CLANWILLIAM: Krakadouw heights, Oct., *Pocock* 665 (STE); Cedarberg, Aug., *Mann*, in herb. Marloth, 11386 (PRE); Nardouw mts., Sept., *Stokoe* s.n. (SAM 62129); Krakadouw peak, Sept., *Thorne* s.n. (SAM 52485); Juriesberg, *Bond* 1392 (NBG); Sneeuwkop, Feb., *Compton* 6313 (NBG); Langberg, Cedarberg, Jan., *Rycroft* 2664 (NBG); West slopes of Sneeuwkop, Jan., *Rycroft* 2669 (NBG); Langberg, Cedarberg, Dec., *Esterhuysen* 7303 (BOL); Cedarberg, peak south of Sneeuwkop, *Esterhuysen* 7585 (BOL); South Cedarberg, Apollo, Dec., *Esterhuysen* 18064 (BOL); Sneeuwkop, Oct., *Bodkin* 13319 (BOL); *A. S. L. Gray* 1 (BOL).

CERES: Roodeberg, summit, Jan., *Esterhuysen* 1495 (BOL); Baviaansberg, Jan., *Stokoe* s.n. (SAM 52719A); Matroosberg, near Laaken vlei, *Phillips* 2119 (SAM); Conical peak, Dec., *Stokoe* s.n. (SAM 56435); Roodeberg, Jan., *Compton* 8401 (NBG); *Stokoe* s.n. (SAM 56436); Matroosberg, Jan., *Esterhuysen* 28153 (BOL); Dec., *A. Bolus* 3941 (BOL); Gideon-skop, south Cedarberg, Oct., *Rourke* 669 (NBG); At Ezelbank, 23/12/1830, *Drège* 8079 (P, G).

WORCESTER: Louwshoek mountain, near beacon, Nov., *Stokoe* s.n. (SAM 58912); Audensberg, Oct., *Compton* 9778 (NBG); *Esterhuysen* 3203 (BOL); Fonteintjiesberg, Hex River mts., March, *Esterhuysen* 8769 (BOL); Stettynsberg, Dec., *Esterhuysen* 11132 (BOL); Goudini Sneeuwkop, June (in fruit), *Esterhuysen* 29068a (BOL); Keeromsberg, summit, Nov., *Esterhuysen* 9194 (BOL); Slanghoek Peak, on the summit dome, Jan., *W. P. Jackson* s.n. (NBG).



Map 16. Distribution of *Spatalla confusa* (Phillips) Rourke.

PAARL: Wemmershoek peak, Dec., *Stokoe* s.n. (SAM 56442); *Esterhuysen* 11346 (BOL); Wellington Sneeuwkop, Dec., *Esterhuysen* 12449 (BOL); Between Uitkyk and Malbrokskloof, 19/7/1833, *Drège* 1489 (P).

SOMERSET WEST: Somerset Sneeuwkop, Nov., *Stokoe* s.n. (SAM 56371); Hottentots Holland near Somerset Sneeuwkop, Sept., *Stokoe* s.n. (SAM 56370).

STELLENBOSCH: Dwarsberg, Victoria Peak, Jan., *Kerfoot* 6201 (NBG).

CALEDON: Riversonderend mts., *Barnard* s.n. (SAM 27391); Jonaskop, June (in fruit), *Williams* 176 (NBG); Somerset Sneeuwkop, Dec., *Esterhuysen* 3556, 8269 (BOL); Summit of Jonaskop, Jan., *Rourke* 3 (BOL).

LAINGSBURG: Witteberg at Whitehill Oct., *Compton* 16290 (NBG); Summit of Witteberg, Jan., *Compton* 2774 (BOL, NBG); Oct., 3170 (BOL, NBG); South slopes of Witteberg, Nov., *Compton* 21128 (NBG); Oct., *Compton* 2725 (BOL); Witteberg, summit Jan., *Esterhuysen* 28841 (BOL); Witteberg, Oct., *Compton* 12226 (NBG); Summit of Witteberg at Bantams, Oct., *Rourke* 1160 (NBG).

LADISMITH: Seven Weeks Poort mts., north slopes, Dec., *Andreae* 1216 (STE, PRE); Dec., *Primos* 56 (STE, PRE); Dec., *Stokoe* 1855 (PRE); Seven Weeks Poort, *Stokoe* 6539 (BOL); Touwsberg, south slopes, June, *Esterhuysen* 25947 (BOL); Towerkop, Dec., *Esterhuysen* 26813 (BOL).

ODTSHOORN/PRINCE ALBERT: Swartberg Pass, rocks at the summit, Nov., *Bolus* 11627 (BOL, PRE, K); Swartberg Pass area, Dec., *Stokoe* s.n. (PRE-29733); Peak west of Swartberg Pass, May, *Pocock* S132 (BOL, PRE); Waboomsberg, Jan., *Oliver* 1655 (CT); Spitskop, 5 miles west of Meirings Poort, Feb., *Thorne* s.n. (SAM 50203); Eight miles west of Swartberg Pass, Nov., *Stokoe* s.n. 69046 (SAM); Blesberg, east of Meirings Poort, Oct., *Esterhuysen* 24904 (BOL); East of Swartberg, *Vogts* 345 (BOL); Swartberg at Vrolykheid, 4/8/1829, *Drège* 8080 (P).

UNIONDALE: Kammanassie, Mannetjiesberg, Feb., *Esterhuysen* 4744 (BOL); Kammanassie range, summit of Mannetjiesberg, March, *Rourke* 369 (NBG).

(4) *Spatalla thyrsoiflora* Salisb. ex Knight in Knight, Cult. Prot. : 74 (1809).

Sorocephalus spatalloides R.Br. in Trans Linn. Soc. Lond. **10** : 141 (1810).

A sprawling decumbent shrub with stems trailing over the ground forming tangled mats 1.5 m in diam. *Branches* decumbent, lax, glabrous to minutely pubescent. *Leaves* acicular terete, somewhat incurved, mucronate, glabrous, 15–30 mm long. *Inflorescence* ovoid—cylindric, 2–4 cm long, 1.5 cm in diam., terminal and single at the apex of a branch, somewhat lax, pedunculate to almost sessile, peduncle up to 1 cm long. *Bracts* broadly lanceolate acute, 6–8 mm long, 2–4 mm wide, margins densely ciliate, outer surface sericeous. *Involucres* 3 flowered, pedicellate, pedicel 2 mm long, villous. Lower three bracteoles lanceolate acute, free, villous to sericeous, 5–6 mm long, 1.5 mm broad, greenish and carmine tipped in the fresh state. Median anticous bracteole narrowly lanceolate, flattened in the vertical plane by the infolding of the margins and subtending a forked to bifid sericeous shoot. *Perianth* 12–14 mm long, limbs strongly curved forward in bud, at right angles to the perianth claws. *Perianth claws* equally developed, thickly villous, becoming spirally coiled on opening. *Perianth limbs* ovate elliptic, 1.5 mm long, woolly. *Perianth tube* cylindric to funnel shaped, villous at the top becoming glabrous towards the base, 1.5 mm long. *Anthers* sessile, elliptic, apical boss round, black. *Style* 10–11 mm long, arched forwards in a cygneus curve. *Pollen presenter* conic

ovoid, black. *Ovary* ovoid, 1 mm long, densely velutinous. *Hypogynous scales* subulate 1 mm long, pale yellow. *Fruits* cylindric ovoid, 6 mm long 3—4 mm in diam. truncate and broadly pedicellate at the base, puberulus.

Diagnosis: *S. thyrsiflora* is distinguished by the matted prostrate growth habit, the 3 flowered involucre, the bifurcating shoot subtended by the median anticous bracteole, and the forwardly arched cygneus style terminating in a conic ovoid pollen presenter.

Niven gives the locality of this species as "Zwartberg". It seems most likely that he is referring to the Swartberg above the town of Caledon and not the Swartberg which separates the Great Karroo from the Little Karroo. There is also a collection at Kew made by Mund on the Caledon Swartberg at an altitude of 3,000 ft. Although no further collections have been made from this locality since Mund's time, there is no reason to believe that *S. thyrsiflora* does not still occur on the Caledon Swartberg.

Sorocephalus spatalloides R.Br. (type at BM), was also described from a Niven specimen which was collected near French Hoek, a locality that is very close to the known distribution area of this species.

Type Material: Zwartberg, dry alpine places, *Niven* 29, Holotype in herb. Kew (K), isotype in herb J. E. Smith (LINN).

Distribution: *S. thyrsiflora* has been recorded by recent collectors from Du Toits Peak, and adjacent Louwshoek Mountains; and also from the Caledon Swartberg by nineteenth century collectors. No recent collections have been made from the latter locality.

Ecology and Biology: This species is unusual in that it has a thick woody persistent rootstock from which new shoots regenerate soon after burning. It is a strictly montane species recorded only between 3,000 and 5,000 ft. in an area of very high winter rainfall (70—100" p.a.). At some localities it is recorded as growing on granite but elsewhere it occurs on Table Mountain sandstone. Flowering commences in October and continues somewhat erratically until December.

Specimens Examined:

WORCESTER: Du Toits Peak, slopes below the peaklet, Nov., *Esterhuysen* 29901 (BOL, NBG); Louwshoek mts., Nov., *Stokoe* s.n. (SAM 58914); Du Toits Kloof, Oct., *Stokoe* s.n. (SAM 62152); Du Toits Peak, granite slopes at west end, north and west aspect, Oct., *Esterhuysen* 31636 (BOL, NBG); Du Toits Peak, granite slopes N.—N.W. of the "Peaklet", Jan., *Esterhuysen* 31453 (NBG).

CALEDON: Zwartberg, *Niven* 29 (K); Zwartberg, Caledon, 3,000 ft., *Mund* s.n. (K).

WITHOUT PRECISE LOCALITY: Hermanus wild flower show, Jan., *L. Guthrie* 340 (BOL). Prom. b. spei, *Dr. Roxburgh* no. 67 (BM).

Map 17. Distribution of *Spatalla thyrsiflora* Salisb. ex Knight.

(5) *Spatalla incurva* (Thunb.) R.Br. in Trans. Linn. Soc. Lond. **10** : 149 (1810).

Protea incurva Thunb., Diss. Prot. : 26 tab. 3 (1781).

Spatalla nana Salisb. ex Knight in Knight, Cult. Prot. : 76 (1809).

Spatalla procera Salisb. ex Knight in Knight, Cult. Prot. : 76 (1809) Nom. illegit.

Spatalla mucronifolia Phillips in Kew Bull. 1910 : 335 (1910).

Spatalla wallichii Phillips in Kew Bull. 1910 : 336 (1910).

An erect to spreading, well branched shrub to 1 m tall, with a stout main stem. *Branches* terete, densely pubescent with a thick indumentum of short crisped hairs. *Leaves* acicular terete, mucronate, straight and ascending, to strongly incurved, sparsely sericeous to glabrous, 7—18 mm long. *Inflorescence* terminal, subsessile to pedunculate, peduncle to 1 cm long; inflorescence 4 cm long, 1.5 cm in diam. *Bracts* lanceolate, 3—5 mm long, sericeous to glabrous, margins ciliate. *Involucres* three flowered, pedicellate, pedicel 1—4 mm long, bracteoles ovate acuminate to acute, very thickly sericeous, 3 mm long, 2 mm broad, free. Median anticus bracteole subtends a reduced vegetative shoot. *Perianth* 7—8 mm long, strongly curved forward in bud, pale pink to carmine in the fresh state. *Perianth limbs* ovate 1 mm long, sericeous, posticus limb slightly larger than the three anticus limbs. *Perianth claws* thickly villous, posticus claw erect, the three anticus claws coiled forwards. *Perianth tube* is slightly inflated due to the broadening of the perianth claws at the base, 2 mm long glabrous at the base, villous above. *Style* 6 mm long, straight except for the subterminal region which is curved at right angles. Pollen presenter obliquely obovoid, with an oblique stigmatic papilla. *Ovary* ovoid, tomentose, 1—2 mm long, the style arising obliquely from the ovary. *Hypogynous scales* subulate, 1—2 mm long. *Fruits* cylindric ovoid, 6 mm long 2 mm broad, sericeous to hispid, hispid at base, truncate and pedicellate at the base.

Diagnosis: *S. incurva* is distinguished from other species of *Spatalla* with 3 flowered involucres by its acicular terete mucronate leaves, the dense crisped indumentum on the stems, the obovate pollen presenter curved forward almost at right angles to the style, and the pubescent fruits.

Although the exact locality at which Thunberg collected the type of *S. incurva* is unknown, the most likely place at which he would have encountered this species is the present day Elands Kloof Pass, in the Cold Bokkeveld. Collections of this species were also by Niven, in the vicinity of Tulbagh and were described as *S. nana* and *S. procera* by Knight (1809). The types of both these species are at Kew and have been examined. Likewise, after the syntypes of *S. mucronifolia* Phillips had been inspected it was quite clear that this species too is conspecific with *S. incurva*. *S. wallichii* Phillips (Holotype in BM, photo of holotype in BOL) is simply a short leaved form of *S. incurva* and must also be reduced to synonymy.

Type Material: South Africa, without precise locality, Thunberg, sheet 2930 in Herb. Thunberg (UPS), holotype.

Distribution: The distribution of *S. incurva* extends from the Cedarberg in the north where it is common, southwards through the Cold Bokkeveld to Tulbagh and the Hex River and Worcester mountains.

Ecology and Biology: This montane species always grows on dry, rocky slopes of Table Mountain sandstone. It is most abundant at altitudes between 4,000 and 6,000 ft. The distribution area falls into a zone of rather low winter rainfall (20—30" p.a.). Snow is occasionally experienced in winter. Flowering commences in September and continues until March.

Specimens Examined:

CLANWILLIAM: Heuning vlei, Cedarberg, Oct., *Pocock* 645 (STE); Sneeuwberg, Cedarberg, Oct., *Pocock* 375 (STE); Ezelbank, Oct., *Thode* A2069 (PRE); Packhuisberg, Sept., *Schlechter* 8611 (BOL, PRE); Ezelbank, Oct., *Schlechter* 8848 (PRE); Boontjies vlei, Cedarberg, Sept., *Stokoe* s.n. (PRE, SAM); Packhuisberg, Sept., *Schlechter* 10814 (BOL, PRE); Cedarberg, Sneeuwberg, *Stokoe* s.n. (SAM, PRE); Middelberg plateau, Dec., *Compton* 12714 (PRE); Crystal Pool, Cedarberg, Sept., *Levyns* 2942 (CT); Kromme River, Aug., *Stokoe* s.n. (SAM 62153); Donker Kloof, Cedarberg, Jan., *Stokoe* s.n. (SAM 56278); Tafelberg, Cedarberg, *Barnard* s.n. (SAM 44118); Krakadouw peak, Cedarberg, Jan., *Stokoe* s.n. (SAM 56277); South Cedarberg, April, *Stokoe* s.n. (SAM 62154); Elands Kloof, March, *Maguire* 886 (NBG); Middelberg, Cedarberg, Sept., *Compton* 7050 (NBG); Juriesberg, Cedarberg, Feb., *Compton* 6310 (NBG); Langberg, Clanwilliam, *Compton* 12754 (NBG); Waterkloof, south west of the spout, Cedarberg, Jan., *Rycroft* 2671 (NBG); Driehoek, Cedarberg, Feb., *Compton* 6311 (NBG); Eikeboom, Clanwilliam, Sept., *Compton* 5036 (NBG); Elands Kloof, Oct., *Compton* 3201 (NBG); Sneeuwkop, Feb., *Compton* 6312 (NBG); Suurvlei, March, *Esterhuysen* 2251 (BOL); Ventersberg, March, *Esterhuysen* 2545 (BOL); Krom River Kloof, S. Cedarberg, Dec., *Esterhuysen* 17990 (BOL); Langberg, Cedarberg, Dec., *Esterhuysen* 7307 (BOL); Middelberg, Dec., *Esterhuysen* 7208 (BOL); Packhuis Pass, *Bolus* 9083 (BOL); Packhuis mts., *Leipoldt* 3513 (BOL); Between Heuning vlei and Koupoort, Oct., *Esterhuysen* 12123 (BOL); Apex peak, south Cedarberg, April, *Esterhuysen* 28972 (BOL); Peak at Koupoort, Oct., *Esterhuysen* 12186 (BOL); Elands Kloof mountains, Oct., *Esterhuysen* 3201 (BOL, NBG); Langberg, Cedarberg, Feb., *Rourke* 1041 (NBG); Blaauwberg, 3,000—4,000 ft., 24/11/1828, *Drège* 1487a (P); Ezelbank, 3,000—4,000 ft., 23/12/1830, *Drège* 1487 b & c (P).

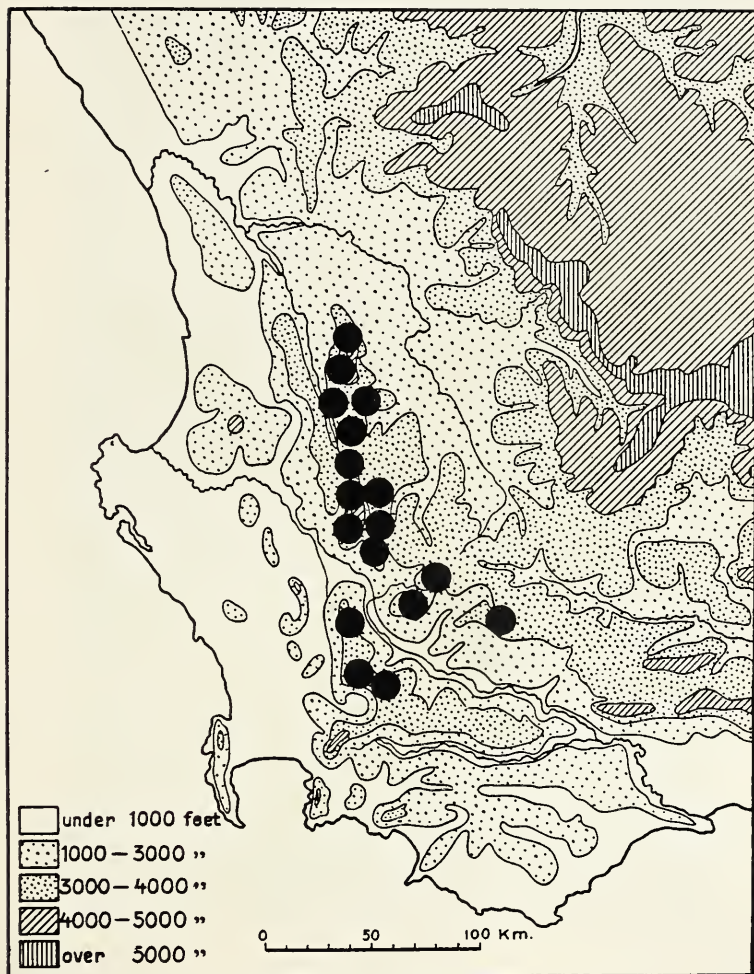
CERES: Gideons Kop, S. Cedarberg, Oct., *Rourke* 670 (NBG); Matroosberg, April, *Marloth* s.n. (STE 13161); Hansiesberg, *Rourke* 21, 25 (BOL); Conical peak Dec., *Stokoe* s.n. (SAM 56434); Hansiesberg, Dec., *Lewis* 937 (SAM); Matroosberg, Nov., *Esterhuysen* 29881 (BOL); Cold Bokkeveld, Schoongezicht, near beacon, *Stokoe* 8055 (BOL, SAM-); Matroosberg, Jan. A. *Bolus* 6370 (BOL); Near Laaken vlei, Matroosberg, *Phillips* 2121 (SAM); Skurfdebergen, near Gydo, Dec., *Bolus* 7562 (BOL); Matroosberg, Aug., *Gillet* 3607 (BOL); Schurweberg peak, Jan., *Esterhuysen* 29437 (BOL).

TULBAGH: Great Winterhoek mts., Jan., *Marloth* 1659 (STE, SAM); Witzenberg mts., Dec., *Pappe* 1480 (PRE); Great Winterhoek peak, near summit, Nov., *Galpin* 12624 (PRE); Great Winterhoek, Feb., *Compton* 4629 (NBG, BOL); Roode Sand, *Niven* (K); Slender shrub, 5 or 6 ft. high by the river, Roode Zand *Niven* s.n. (K); Cascade, Roode Zand, *Roxburgh* (G).

WORCESTER: Sawedge peak, east of Keeromsberg, Sept., *Esterhuysen* 31147 (NBG); Du Toits Kloof, *Drège* (SAM, NY); Waaihoek peak, Dec., *Esterhuysen* 18197 (BOL, PRE); Buffelshoek peak, Hex River mts., Dec., *Esterhuysen* 8427, 8429 (BOL); Waaihoek peak, Dec., *Esterhuysen* 8353 (BOL); Mitchells peak Dec., *Esterhuysen* 14776 (BOL); Milner peak, Jan., *Esterhuysen* 28104 (BOL); Mosterts Hoek Twins, Jan., *Esterhuysen* 9891 (BOL); Du Toits Kloof, Jan., *Marloth* (PRE).

PAARL: Du Toits Kloof, 28/2/1827 and 30/1/1828, *Drège* 1487 (P); Uitkyk and Malbrokskloof, 3,000—4,000 ft., 7/2/1828, *Drège* 1487 (P).

WITHOUT PRECISE LOCALITY: Cap. b. spei, *Thunberg* in herb. *Montinii* (S); Cap. b. spei, G. Hibbert, *Niven* 30, in herb. J. E. Smith (LINN). Cap. b. spei, *Thunberg* in herb. Bergius (SBT); Without locality, *Sonnerat* cat. no. 4130 in herb. de Jussieu (P—JU); Without collector or locality in herb. Lamarck (P—LA); Prom. bon. spei *J. Roxburgh* (G); Without collector or locality in herb. Burman (G); C.B.S. *Dr. Wallich* (G).



Map 18. Distribution of *Spatalla incurva* (Thunb.) R.Br.

(6) *Spatalla argentea* Rourke, sp. nov.

Differt a *S. incurva*, foliis dense permanentibus argentiis sericiis, prominenter galeatis posticis perianthii limbis et stigmatibus obovato discoideo cochleariforme.

Frutex erectus ad 0.75 m altus. *Folia* teretia, patens vel adscendens, dense sericea argentea, 10–15 mm longa. *Inflorescentia* sessilia, cylindracea ovoidea 2–3 cm longa, 1.5 cm in diam. *Involucra* triflores, pedicellata. *Pedicellii* 2–3 mm longae. *Bracteolae* discretæ, late ovate acutæ, 4 mm longæ 2 mm latae, dense sericeae. *Perianthium* 8 mm longum, lanatum vel villosum. *Perianthii limbus* postice prominenter galeatus. *Perianthii tubus* 1.5 longus, externe villosus. *Stylus* strictus, 6 mm longus. *Stigma* ater, oblique obovatum cochleariforme discoideum. *Fructus* cylindraceus, sericeus, 6 mm longus, 2 mm latus; ad basim truncatus et pedicellatus.

An erect well branched shrub to 0.75 m with a single main stem branching at 20 cm. *Branches* erect, terete, puberulus, covered with ascending silvery leaves. *Leaves* acicular terete, mucronate, slightly spreading, ascending to incurved, 10–15 mm long, very densely sericeous, silvery. *Inflorescence* terminal, sessile, or with up to 4 lateral inflorescences arising at the apex of a shoot; 2–3 cm long, 1.5 cm in diam. *Bracts* lanceolate acute, 6 mm long, densely sericeous, silvery. *Involucres* 3 flowered, pedicellate, pedicel 2–3 mm long. *Bracteoles* free, broadly ovate acute, 4 mm long, 2 mm broad, very densely sericeous, margins ciliate. Median anticus bracteole subtends a short reduced shoot. *Perianth* 8 mm long, strongly curved forward in bud, perianth segments unequal. Posticous segment erect and galeate, larger than the three anticus segments. *Perianth limbs* elliptic, 1 mm long, lanate. Posticous perianth limb strongly galeate, larger than the three anticus limbs. *Perianth claws* thickly villous, the three anticus claws becoming coiled on opening. *Perianth tube* 1.5 mm long, villous, slightly quadrangular. *Style* straight, 6 mm long. *Pollen presenter* a dark black obliquely obovate cochleariform disc. *Ovary* ovoid, 1 mm long, tomentose. *Hypogynous scales* 1 mm long linear subulate. *Fruits* cylindric 6 mm long, 2 mm broad, sericeous, truncate and broadly pedicellate at the base.

Diagnosis: This species is distinguished from *S. incurva* by the permanent densely sericeous silvery pubescence of the leaves, the obovate cochleariform pollen presenter and the distinctly galeate posticous perianth limb.

Type Material: Jonas Kop, upper north slopes, Nov., Rourke 975, holotype in Compton herbarium (NBG).

Distribution, Ecology and Biology: *S. argentea* has a very limited distribution and is confined to the north slopes of Jonas Kop (also known by the



PLATE 4.

Spatalla argentea Rourke. Inflorescence with the lowermost flowers open. Note the three flowered involucre and the erect galeate posticous perianth segments. Part of the type material, Rourke 975. ($\times 2$).

Map 19. Distribution of *Spatalla argentea* Rourke.

names Wildepaardeberg, Omklaar, and Bosjeveld mountains). The plants occur as scattered isolated individuals on level sandy patches between large Table Mountain sandstone boulders on hot, dry north facing slopes at an altitude of 3,500—4,000 ft. They have always been found growing in close association with *Leucadendron nervosum*, a rare species which is also endemic to Jonas Kop. Flowering commences in October and continues into January.

Specimens Examined:

WORCESTER: Waterkloof, Wildepaardeberg, Jan., *Stokoe* 1132 (BOL, PRE); Northern slopes of Jonas Kop, Jan., *Rourke* 4 (BOL, NBG); Bosjeveld mts., Villiersdorp side, Feb., *Stokoe* s.n. (SAM 56449); Jonas Kop, Oct., *Middlemost* 2316 (NBG); Omklaar, Feb., *Stokoe* 8057 (BOL); Jonas Kop, north slopes, Jan., *Rourke* 722 (NBG); Jonas Kop, upper slopes, Sept., *Rycroft* 2875 (NBG); Upper north slopes of Jonas Kop, Nov., *Rourke* 975 (NBG).

(7) *Spatalla propinqua* R.Br. in Trans. Linn. Soc. Lond. **10** : 150 (1810).

Spatalla incurva (Thunb.) R.Br. var. *zeyheri* Meisn. in DC., Prodr. **14** : 309 (1856).

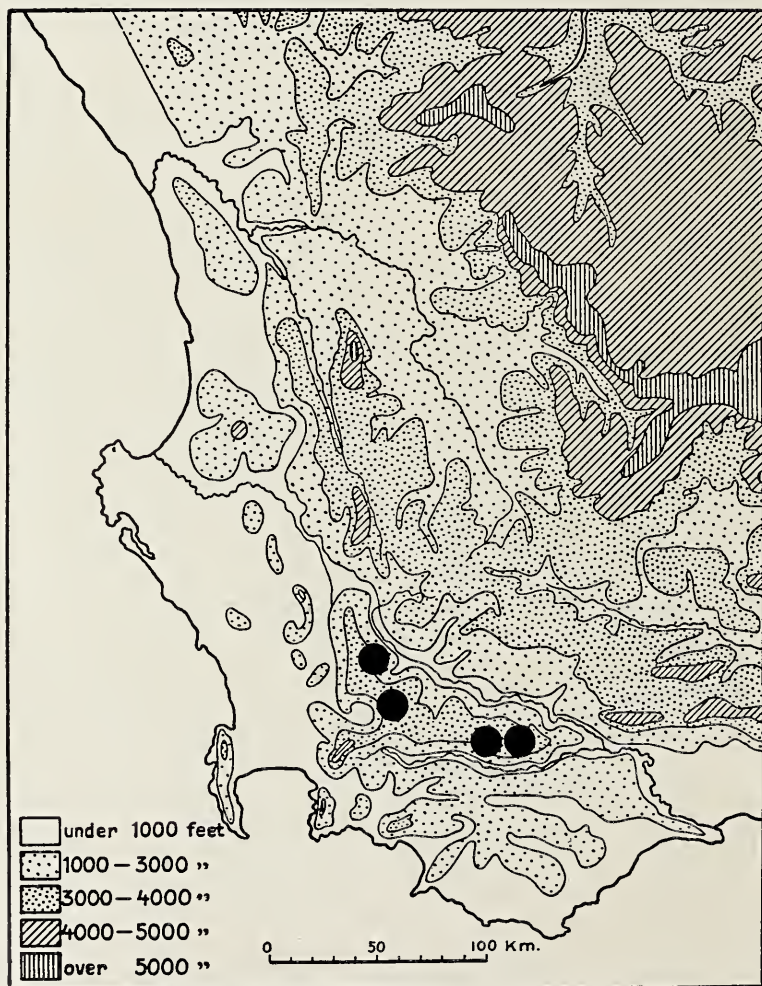
Spatallopsis propinqua (R.Br.) Phillips in Kew Bull. **1910** : 290 (1910).

An erect shrub, 1 m tall, developing a stout main stem. *Branches* slender, erect, terete. *Leaves* acicular terete 15—25 mm long, tipped with a long (1 mm) mucro, pilose at first, soon glabrous, upper surface occasionally canaliculate. *Inflorescence* subsessile to pedunculate, peduncle 1—3 cm long. Inflorescence lax, narrowly cylindric to conic, 3—10 cm long, 1 cm broad, terminal, or with up to 5 lateral spikes arising around the peduncle. *Bracts* linear subulate, 7 mm long, sericeous. *Involucres* pedicellate, 3 flowered, pedicel villous. *Bracteoles* free, ovate acuminate, thinly villous to sericeous, margins densely ciliate, 3—5 mm long. Median anticus bracteole subtends an abortive shoot, smaller than the two lateral bracteoles. *Perianth segments* unequal, posticus segment larger than the three anticus segments. *Perianth limbs* ovate elliptic 1 mm long, sericeous, posticus limb erect, strongly galeate. *Perianth claws* thickly villous, the three anticus claws spreading outwards, recurved and coiled. *Perianth tube* 1 mm long, villous, cylindric. *Anthers* ovate, elliptic, sessile, apical boss black and rounded. *Style* straight but strongly curved forwards at the apex, 6—7 mm long. *Pollen presenter* a dark obliquely obovate cochleariform disc. *Ovary* ovoid, 1 mm long, tomentose. *Hypogynous scales* 1 mm long, subulate, hyaline to pale yellow. *Fruits* cylindric, 5—6 mm long, 2 mm broad, truncate and pedicellate at the base, glabrous to minutely pubescent in the basal region.

Diagnosis: Among the species of *Spatalla* with 3 flowered involucres *S. propinqua* is distinguished by the obovate cochleariform discoid pollen presenter, the erect, galeate posticus perianth limb, the glabrous to near glabrous fruits, the villous perianth tube, and the long, slender cylindric inflorescence (3—10 cm long).

Type Material: South Africa, without precise locality, *A. Auge*, holotype in British museum.

Distribution: This species is confined to the mountain ranges lying to the south and west of the Breede River valley.



Map 20. Distribution of *Spatalla propinqua* R.Br.

Ecology and Biology: *S. propinqua* inhabits permanently wet, swampy situations, on cool south facing slopes and in this respect it differs markedly from two related species, *S. argentea* and *S. incurva*. Flowering commences as early as June or July. A second flush of inflorescences is produced in early summer which results in the flowering period lasting until March.

Specimens Examined:

WORCESTER: Slanghoek, July, *I. B. Walters* 254 (NBG).

STELLENBOSCH: Klein Drakenstein, Sept., *H. Hellmuth* s.n. (STE 16852); French Hoek mts., *Marloth* 8374 (PRE); On a plateau between Victoria peak and Jonkershoek valley, March, *Rourke* 741 (NBG).

CALEDON: Riviersonderende mts., *Zeyher* 3720 (SAM); Morning Star, Riversonderend, July, *B. Swart* s.n. (NBG 42561); Riversonderend, *Knoblauch* s.n. (SAM 19829); Olifants River valley, Riversonderend, June, *Williams* 751 (NBG). "Shrub three or four feet high, alpine, good black soil, French Hoek", *Niven* 29 (K); By the river at Riversonderend, Sept., *Zeyher* 3720 β (K).

WITHOUT PRECISE LOCALITY: Africa australis, *Auge* (BM).

(8) ***Spatalla salsoloides*** (R.Br.) Rourke, comb. nov.

Sorocephalus salsoloides R.Br. in Trans. Linn. Soc. Lond. 10 : 140 (1810)—basionym.

Protea salsoloides (R.Br.) Poir. in Lam. Encycl. Meth. Bot. Supp. 4 : 576 (1816).

Soranth salsoloides (R.Br.) O. Kuntze, Rev. Gen. Pl. 2 : 582 (1891). (ex err. salsolodes).

A semi-erect, much branched shrub to 1 m with spreading prostrate stems bearing ascending branchlets; forming mats 1 m in diam. *Leaves* acicular terete, incurved, mucronate, very sparsely pilose when young, soon glabrous, 15—30 mm long. *Inflorescence* single, terminal, sessile, globose to ovoid, 2 cm long 1 cm in diam., a densely congested raceme. *Bracts* lanceolate to broadly lanceolate, acute, thinly sericeous, 5 mm long 1—1.5 mm wide. *Involucres* sessile, one-flowered. *Bracteoles* lanceolate acute, naviculiform, 5—6 mm long, 1 mm wide, sparsely sericeous to glabrous, margins ciliate. The three anticus bracteoles fused in their lower third, slightly incurved. Posticus bracteole free. *Perianth* 8—9 mm long, curved forward in the limb region in bud; silvery carmine in fresh state. *Perianth segments* equal, becoming twisted and coiled on opening. *Perianth limbs* lanceolate, 1.5 mm long, densely sericeous. *Perianth claws* narrow, becoming twisted and coiled on opening, villous on outer surface and inner margin. *Perianth tube* 2 mm long, cylindric to slightly quadrangular, glabrous. *Style* 9 mm, curved forwards at the apex. *Pollen presenter* cylindric-ellipsoid, geniculate at junction of style and pollen presenter. *Ovary* ovoid 1 mm long, tomentose. *Hypogynous scales* subulate linear, hyaline, 1 mm long. Fruits ovoid 4 mm long, 2 mm broad, pubescent, somewhat laterally compressed with a distinct apical beak, wrinkled, broadly pedicellate at the base.

Diagnosis: Among the species of *Spatalla* with sessile one-flowered involucre, *S. salsoloides* may be distinguished by the cylindric to ellipsoid pollen presenter, geniculate at its junction with the style. It is most closely related to *S. setacea* from which it is distinguishable in the field by its sprawling divaricate habit of growth.

The first recorded collection of this species was made by Dr. William Roxburgh in 1799. Roxburgh, who held the position of Superintendent of the Calcutta Botanic garden had called at the Cape in 1799 where he "resided a twelvemonth" before continuing to India (Britten 1920 : 42). The extent of his travels at the Cape is unknown but judging from the species which he collected he must have found the Hottentots Holland and Du Toits Kloof mountains particularly attractive, for even at that early stage he had collected *Spatalla thyrsoflora*, *S. setacea*, *S. mollis* and *S. longifolia*, all of which occur here at relatively high altitudes. From these clues we may deduce that Roxburgh made several forays into the Hottentots Holland and adjacent mountains and in this respect he stands out among the eighteenth century collectors at the Cape since most of his contemporaries (with the exception of Niven), had conspicuously avoided rugged terrain except where it was traversed by waggon tracks.

Unfortunately, no locality was given for the original collection which was described under the genus *Sorocephalus* by Brown. (See under *Sorocephalus crassifolius* in this work.) It was not until 1960 that the species was rediscovered by Miss E. E. Esterhuysen of the Bolus herbarium, who located populations on Goudini Sneeuwkop and the adjacent Du Toits peak. There is no record whatever of any collection of this species having been made during the intervening one hundred and sixty one years. We must therefore assume that unless other populations of *S. salsoloides* exist which have not yet been discovered, Roxburgh must have made his collection in the vicinity of Goudini Sneeuwkop. Roxburgh did make at least one collection from "near Brant Fly's hill" which can be interpreted as being a hill near Brand Vlei. As Brand Vlei is one of the approaches to Goudini Sneeuwkop there is thus an even stronger possibility that Roxburgh collected on this peak. Considering the inaccessibility and altitude of Goudini Sneeuwkop, the ascent of this mountain in 1799 would have been a not inconsiderable achievement for a man who was then 48 years of age.

Type Material: Africa australis, Protea no. 70, Roxburgh, holotype (BM).

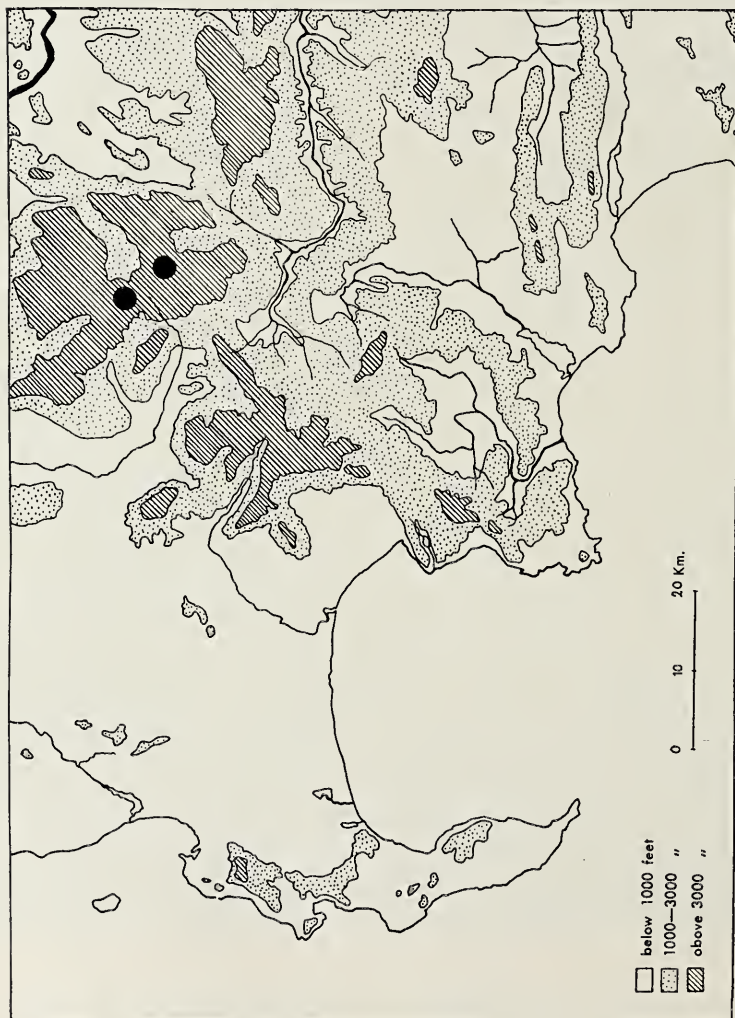
Distribution, Ecology and Biology: This montane species has only been recorded between 5,000 and 6,000 ft., and is restricted to a region of high winter rainfall (70—100" p.a.). The plants form dense tangled mats on the rocky



PLATE 5.

Spatalla salsoloides (R.Br.) Rourke. The posticous perianth segment is erect, the remaining three being coiled abaxially. Note the pollen masses clinging to the pollen presenters. Photograph of a single inflorescence ($\times 3$), from Esterhuysen 31666.

south eastern slopes of Goudini Sneeuwkop and Du Toits peak, these being the only two populations known. Flowering takes place between the end of October and early December.



Map 21. Distribution of *Spatalla salsoloides* (R.Br.) Rourke.

Specimens Examined:

WORCESTER: Goudini Sneeuwkop, south east slopes, Oct., *Esterhuysen* 28564 (BOL); Goudini Sneeuwkop, slopes below shale band, June (in bud), *Esterhuysen* 29068 (BOL); Goudini Sneeuwkop, south slopes, Dec., *Esterhuysen* 31667 (BOL, NBG).

PAARL: Du Toits peak, about 2 hrs. from summit towards Goudini Sneeuwkop, Dec., *Esterhuysen* 31666 (BOL, NBG).

WITHOUT PRECISE LOCALITY: Africa australis. Protea no. 70, *Roxburgh* (BM); Prom. bon. spei, *Roxburgh* (G).

(9) *Spatalla setacea* (R.Br.) Rourke, comb. nov.

Sorocephalus setaceus R.Br. in Trans. Linn. Soc. Lond. 10 : 140 (1810)—basionym.

Spatalopsis begleyi Phillips in Ann. S. Afr. Mus. 9 : 274 (1915).

Soranthe setacea (R.Br.) O. Kuntze, Rev. Gen. Pl. 2 : 582 (1891).

An erect, well branched, rounded shrub to 1 m tall, main stem stout and rigid. *Branches* erect, rigid, at first very sparsely villous, soon becoming quite glabrous, bark reddish when young. *Leaves* acicular terete, tipped with a long slender hyaline mucro, sparsely villous when young, soon glabrous, 20—30 mm long, loosely imbricate to spreading, straight to slightly incurved. *Inflorescence* terminal, sessile, globose to ovoid, 1—2.5 cm in diam., a densely congested raceme. *Bracts* narrowly lanceolate acute, 5 mm long, glabrous, margins ciliate. *Involucres* subsessile, pedicels 1 mm long. *Bracteoles* 4—5 mm. Posticous bracteole free, the three anticous bracteoles fused at the base forming the anticous lip of the involucre. Bracteoles lanceolate acute, glabrous to sparsely hispid, margins ciliate. *Perianth* 10—12 mm long, strongly curved forward in bud. *Perianth limbs* elliptic, densely villous. *Perianth claws* villous, widening towards the base where they become glabrous. *Perianth tube* short, 1 mm long, inflated due to the broadening of the bases of the perianth claws, glabrous. *Anthers* elliptic, with a rounded black apical boss; pollen pinkish. *Style* slender, 9 mm long, curved forward at the apex. *Pollen presenter* cylindric—ellipsoid. *Ovary* ovoid, 1 mm long, tomentose. *Hypogynous scales* subulate linear, 1 mm long, pale yellow when fresh. *Fruits* ovoid, 5 mm long, 2 mm in diam., base acute but broadly pedicellate, style remains at apex forming a prominent beak.

Diagnosis: Distinguished by the long leaves (20—35 mm), the densely congested globose inflorescence, the single flowered involucres, the ellipsoid pollen presenter, and the perianth which is inflated at the base.

S. setacea was originally described as a *Sorocephalus* (which it superficially resembles), by Robert Brown, who based his description on a collection by Roxburgh, now in the British Museum. The specimen is labelled "Africa australis, Stellenbosch, Dr. Roxburgh" in Brown's handwriting and was in all probability collected on the north end of the Hottentots Holland mountains, above

Stellenbosch. Roxburgh's collection was made in 1799 but it was not until 1913 that the next collection appears to have been made. This material was also obtained in the Hottentots Holland mountains, south of Sneeuwkop, by H. W. Begley, and was described as *Spatallopsis begleyi* by Phillips (holotype, sheet no. 7649 in SAM, isotypes in STE and K). I consider it to be synonymous with *S. setacea* R.Br.

Type Material: Africa australis, Stellenbosch, Dr. Roxburgh, holotype (BM).

Distribution: The most northerly record of this species is from Witteberg peak in the Du Toits Kloof mountains. The main populations are found on the Wemmershoek, Fransch Hoek and Hottentots Holland mountains, reaching Kogelberg in the south.

Ecology and Biology: *S. setacea* is a strictly montane species confined to relatively high altitudes where it occurs mostly between 3,000 and 4,000 ft. Its normal habitat is on the black peaty "sponges" found on damp south facing slopes. Occasionally rather stunted specimens are found growing in drier, rocky and more exposed situations.

A copious supply of water appears to be a prerequisite for this species and it is noteworthy that its entire distribution area falls within the 50–100" p.a. rainfall zone, the highest in the winter rainfall area. In summer the frequent



FIG. 20: *Spatalla setacea*. (1) Lateral view of young bud showing abaxial curvature ($\times 10$) (2) Flower just before anthesis ($\times 8$) (3) style and ovary ($\times 8$) (4) fruit ($\times 8$).

banks of south-easterly cloud which regularly cover the area, provide continuous supply of moisture. Flowering takes place between October and December, the fruits maturing in January and February.



Map 22. Distribution of *Spatalla setacea* (R. Br.) Rourke.

Variation: The specimens from Witteberg, Paarl, and the Wemmershoek mountains, tend to have hispid bracteoles while the material from the more southerly localities has glabrous bracteoles.

Specimens examined:

PAARL: Slanghoek mts., Witteberg, Nov., *Wasserfall* 646 (NBG); Nov., *Esterhuysen* 9467 (BOL); Wemmershoek peak, Dec., *Esterhuysen* 11347 (BOL); April peak, Wemmershoek, Dec., *Esterhuysen* 4131 (BOL); Winterberg, Dec., *Esterhuysen* 9640 (BOL); The Old Toll, French hoek pass, Sept., Guthrie 352 (BOL).

STELLENBOSCH: Dwarsberg, Jonkershoek, Nov., *H. C. Taylor* 6588 (NBG); Victoria Peak, Jan., *Esterhuysen* 9772 (BOL); Dwarsberg, June, *Kruger* 467 (NBG); In the great gorge between Emerald Dome and Victoria Peak, Feb., *Rourke* 1048 (NBG); Jonkershoek, Dwarsberg, Dec., *Kruger* 294 (NBG), *Africa australis*, Stellenbosch, *Dr. Roxburgh* s.n. (BM).

SOMERSET WEST: Moordenaarskop, Oct., *Esterhuysen* 9126 (BOL); Rooskraalberg, July, *Esterhuysen* 2641 (BOL); Somerset Sneeuwkop, Dec., *Esterhuysen* 3553 (BOL); *Esterhuysen* 8248 (BOL); Sept., *Stokoe* s.n. (SAM 56367); South of Sneeuwkop, Jan., *Begley* s.n. (SAM 7649); Between Somerset Sneeuwkop and Landrostkop, Sept., *Stokoe* s.n. (PRE 29734); Nov., *Stokoe* s.n. (SAM 54167); *MacPherson* s.n. (NBG); Sugar loaf, July, *Stokoe* s.n. (SAM 56369); Landrost Kloof, Hottentots Holland mountains, Feb., *Esterhuysen* 31483 (NBG); Nuweberg forest reserve, Aug., *Rourke* 825 (NBG).

CALEDON: Paardeberg, Kogelberg reserve, Dec., *Grobler* 0113 (PRE); Elgin, July, *Compton* 6420 (NBG); Kogelberg, Nov., *Stokoe* s.n. (SAM 56368); Kogelberg, summit, Feb., *Rourke* 323 (NBG).

(10) *Spatalla nubicola* Rourke, sp. nov.

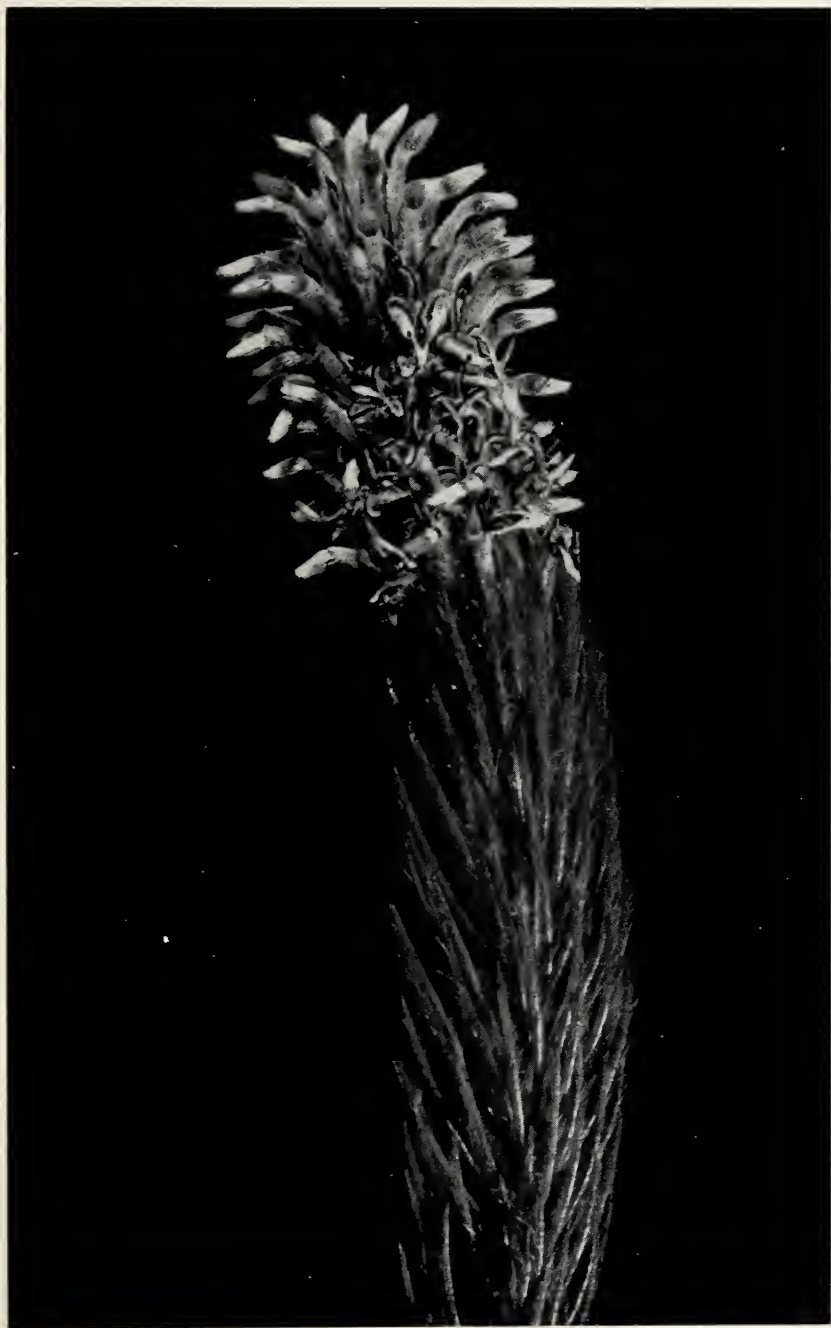
Species insignis involucris unifloribus; distinctissima inflorescentiis longis sessili confertis cylindricis, stigmatibus obliquis capitatis.

Frutex erectus 1—1.5 m altus, ramosissimus. *Ramuli* hornotini et annotini rigidi et crassi. *Folia* dense imbricata adscendentia, linearia, mucronata, parce glabra, 10—15 mm longa. *Inflorescentia* sessilia, densa cylindracea, 3—4 cm longa. *Involucra* 1—flora, sessilia. *Bracteolae* 5 mm longae, lanceolatae acutae, labium superum integrum, labium inferum profunde tridentatum, sparsum sericeum vel glabrum. *Perianthium* rectum, sed apicem versus curvatum, 11 mm longum. *Perianthii limbus* ovatus, dense sericeus. *Perianthii tubus* 5 mm longus, glaber vel apicem versus puberulus. *Stylus* strictus. *Stigma* obliqua ovoidea.

An erect, rounded, fairly stout and woody shrub, 1—1.5 m tall, main stem stout, branching at 15 cm from ground level. *Branches* erect, older branches covered with rough scars of the leaf bases. *Leaves* acicular terete, mucronate,

PLATE 6.

Spatalla nubicola Rourke. Inflorescence with the lowermost flowers open. Note the abaxial curvature of the perianth in the bud stage. Part of the type material, *Rourke* 630. ($\times 2$).



thinly pilose when young, soon glabrous, 10—15 mm long. *Inflorescence* terminal, sessile, a densely flowered cylindric raceme, 3—4 cm long, 1—1.5 cm wide. *Involucres* one flowered, sessile. Bracts linear lanceolate, incurved, villous, 7 mm long. The three anticus bracteoles of the lower lip, lanceolate acute, reddish, sericeous, fused in their lower third. Posticus bracteole free, lanceolate acute, sericeous, margins ciliate. *Bracteoles* 5 mm long. *Perianth* straight in bud, but curved forwards in the limb region, 11 mm long, the four segments more or less equal. *Perianth claws* narrow, curved outwards, carmine in live state, villous. *Perianth limbs* ovate, covered with a dense indumentum of long straight silvery hairs. *Perianth tube* glabrous, becoming slightly pubescent at the top, 5 mm long. *Anthers* ovate, 1 mm long, apical boss rounded, amber, pollen creamy-white. *Style* 9 mm long, filiform. *Pollen presenter* oblique, ovoid—capitate, stigmatic groove in a small apical papilla. *Ovary* ovoid, 1 mm long, puberulus, style arising from the ovary in an oblique position *Hypogynous scales* 1 mm long, subulate, hyaline. *Fruits* ovoid, 5 mm long, with a broadly pedicellate acute base.

Diagnosis: The most distinctive features of *S. nubicola* are the sessile, densely congested cylindric racemes, the sessile, single flowered involucres and the obliquely ovoid to capitate pollen presenters.

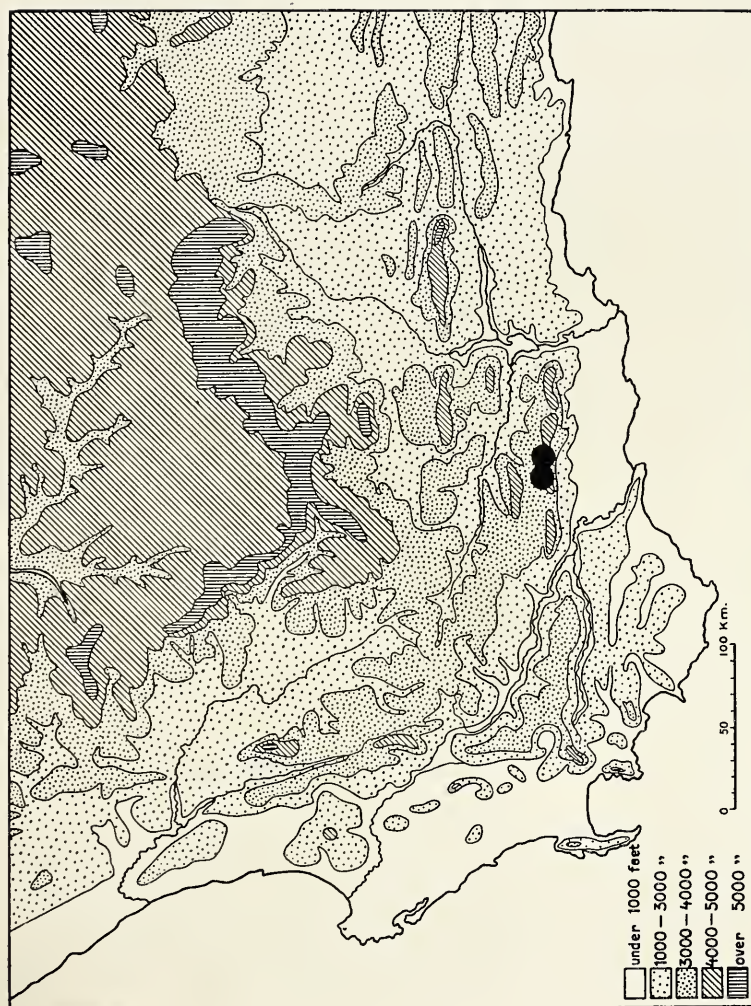
Type Material: Langebergen, Lemoenshoek peak, on steep, almost vertical south slopes below the summit, 5,300 ft., Oct., *Rourke* 630, holotype in Compton herbarium Kirstenbosch (NBG).

Distribution: *S. nubicola* is endemic to the Langebergen and is confined to the Heidelberg district. In 1944 Miss E. E. Esterhuysen of the Bolus herbarium collected this remarkable new species for the first time, on Lemoenshoek peak. She subsequently gathered further material on the neighbouring Naaukrans peak. *S. nubicola* is known from these two localities only.

Ecology and Biology: This is a high altitude species, restricted to a very narrow zone around the 5,000 ft. contour. It is found growing in dense stands on the very uppermost steep southern slopes, always on damp black peaty soils. This locality receives a high rainfall (60—75" p.a.), and in addition there is frequently a mist covering during the summer months. Flowering commences in September and continues into December. Although the majority of plants that were seen had pink perianths, an occasional albino with a whitish-cream perianth was observed.

Specimens Examined:

HEIDELBERG, C.P.: Lemoenshoek peak, Oct., *Esterhuysen* 25038 (BOL, NBG); April (in fruit), *Esterhuysen* 29506 (BOL); Oct., *Rourke* 630 (NBG); Sept., *Esterhuysen* 10469 (BOL); Naaukrans peak, March, *Esterhuysen* 14427 (BOL).



(11) *Spatalla parilis* Salisb. ex Knight in Knight, Cult. Prot. : 75 (1809).

Spatalla bombycina Salisb. ex Knight in Knight, Cult. Prot. : 76 (1809).

Spatalla pyramidalis R.Br. in Trans. Linn. Soc. Lond. **10** : 148 (1810).

Spatalla polystachya R.Br. in Trans. Linn. Soc. Lond. **10** : 148 (1810).

Protea pyramidalis (R.Br.) Poir. in Lam., Encycl. Meth. Bot. Supp. **4** : 578 (1816).

Protea polystachya (R.Br.) Poir. in Lam. Encycl. Meth. Bot. Supp. **4** : 579 (1816).

Spatalla bolusii Phillips in Kew Bull. **1910** : 333 (1910).

An erect well branched shrub to 1·5 m, with a stout main stem. *Branches* erect, slender, terete, thinly sericeous to glabrous. *Leaves* acicular terete, mucronate, 15—20 mm long, thinly sericeous, soon glabrous, erect ascending or outwardly spreading. *Inflorescence* sessile, a long narrow cylindric spike 3—6 cm long, 1—1·5 cm in diam.; usually terminal but with up to 6 lateral inflorescences developing below the main terminal inflorescence. *Bracts* acicular, sericeous, 7—9 mm long. *Involucres* single flowered, pedicellate, pedicel 2—3 mm long, sericeous. *Bracteoles* very narrowly lanceolate acuminate, 4—6 mm long, thinly sericeous to glabrous. Posticous bracteole free, the three anticus bracteoles fused only at the base. *Perianth* 9—10 mm long, strongly curved forward in bud. *Perianth segments* unequal, posticous segment galeate, larger than the three anticus segments. *Perianth limbs* elliptic, lanate, posticous perianth limb galeate. *Perianth claws* villous, the three anticus claws spreading forwards, posticous claw erect. *Perianth tube* 2—3 mm long, glabrous becoming villous towards the top. *Anthers* ovate, 1 mm long, apical boss black, rounded. *Style* erect, straight, 6—7 mm long. *Pollen presenter* an obliquely obovate cochleariform disc. *Ovary* ellipsoid, 1—2 mm long, sericeous. *Hypogynous scales* subulate, 1 mm long, pale yellow. *Fruits* cylindric ovoid, 4—5 mm long, slightly emarginate to truncate, broadly pedicellate at the base.

Diagnosis: *S. parilis* may be distinguished from all other species of *Spatalla* with sessile inflorescences and pedicellate involucres, by the very narrowly lanceolate acuminate to linear bracteoles.

Spatalla parilis and *S. bombycina* were described simultaneously and are synonymous. The type specimen of *S. parilis* was collected by Roxburgh and is labelled "Stellenbosch mountains Parilis ms." in R. A. Salisbury's handwriting while the type material of *S. bombycina* was collected by Niven at Sweet Milk valley. Both these types are at Kew. As the name *S. parilis* has been the more commonly used in the past, it has been adopted in the present revision. The types of *S. polystachya* R.Br. and *S. pyramidalis* R.Br. have been examined at the British Museum and there can be no doubt that both are conspecific with *S. parilis*. Type material of *S. bolusii* Phillips has also been examined and has proved to be a rather stunted high altitude form of this species.

Type Material: Stellenbosch mountains, *Roxburgh*, in herb, R. A. Salisbury (K), holotype.

Distribution: Although there are records from as far west as the Hottentots Holland, the species appears to be rare here. The main area of distribution extends from the mountains above Greyton (Caledon district), eastwards along the Langeberg, the most easterly station being just beyond Riversdale.

Ecology and Biology: This is a species which is frequently encountered on the Langeberg where it always occurs on black peaty soils in moist situations on cool south facing slopes. *S. parilis* only grows where it receives a relatively high winter rainfall and sufficient moisture in summer (30—60" p.a.). Cloud and mist caused by south-easterly winds, ensure an adequate supply of moisture during the summer. The altitudinal range is considerable, being from 1,000—5,000 ft. Although most stands occur on the higher slopes, plants can be found at altitudes as low as 1,000 ft. provided the situation is permanently moist. The plants are usually found in small scattered colonies. Flowering occurs throughout the year.

Specimens Examined:

SOMERSET WEST: Landdrost Kop, lower slope of upper pitch of mountain, *Stokoe* 8367 (BOL); Hottentots Holland, *Zeyher* 3720 (partly) (PRE, BOL, SAM, NY); Stellenbosch mountains, *Roxburgh* (K).

CALEDON: Schilpad Kop, Riversonderend mts., April, *Esterhuysen* 7972 (BOL); Zoetmelk Vlei mts., Riversonderend, *Grisbrook* 3538 (BOL); Sweet Milk Valley, *Niven* 39 (K); Riversonderend, *Barnard* 425 (SAM); Riversonderend Peak, Nov., *Thorne* s.n. (SAM 45798); Lindeshof, above Krom River farm, Aug., *Esterhuysen* 31576 (NBG); Baviaanskloof near Genadendal, Feb. 16th 1815, *Burchell* 7796 (K); "Plant 4 ft. high, elevated moist places, Sweet milk valley" *Niven* 38 (K).

SWELLENDAAM: 9 o'clock Peak above Swellendam, Sept., *H. C. Taylor* 3881 (STE, PRE); Swellendam, July, *Ery* s.n. (PRE 29738); South slopes of the Langeberg, Jan., *Esterhuysen* 18254 (BOL); Langeberg mts., April, *Bolus* 686 (BOL, SAM); Near Swellendam, Jan., *Bolus* 8094 (BOL); Swellendam mts., south slopes, Feb., *Esterhuysen* 4801 (BOL); One o'clock Peak, Sept., *Esterhuysen* 26286 (BOL); The Crown, Swellendam, April, *H. C. Taylor* 84 (BOL); Twelve o'clock Peak, April, *Wurts* 23 (NBG); Swellendam mts. Feb., *Bond* 956 (NBG); Eleven o'clock Peak, south slopes, May, *H. C. Taylor* 4759 (PRE); Langeberg, above the Marloth Reserve Swellendam, Jan., *Rourke* 284 (NBG).

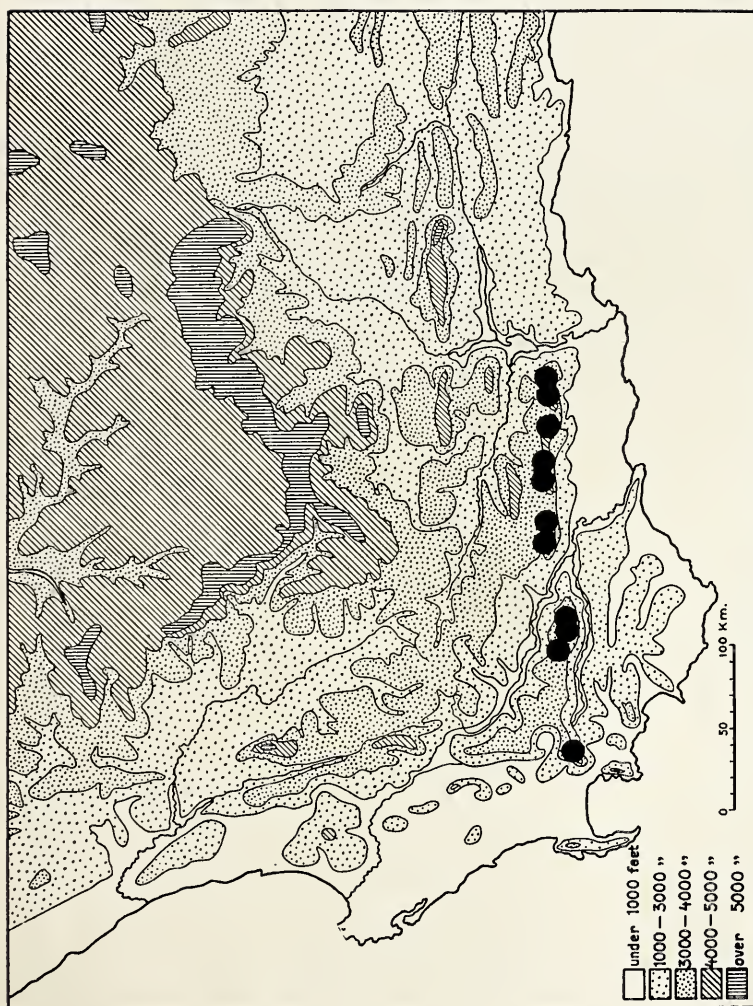
HEIDELBERG: Grootvadersbosch, Dec., *H. C. Taylor* 2958 (STE, PRE); Lemoenshoek Peak, April, *Esterhuysen* 29505 (BOL); Sept., *Esterhuysen* 10468 (BOL); Grootvadersbosch, *Pappe* s.n. (SAM 19826); Lemoenshoek mountain, *Stokoe* s.n. (SAM 62149); Grootvadersbosch, Dec., *Jackson* s.n. (NBG 10504); Oct., *Ludwig* s.n. (NY); Strawberry Hill, Dec., *Stokoe* s.n. (NBG 9906); Lemoenshoek Peak, lower south slopes, Oct., *Rourke* 640 (NBG).

RIVERSDALE: Garcias Pass, *Phillips* 511 (PRE, SAM); Langeberg near Riversdale, Nov., *Schlechter* 1772 (BOL, PRE, STE); Kampsche Berg, south face, Oct., *Galpin* 4488 (PRE); Mountains above Riversdale, Nov., *Muir* 577 (PRE); Garcias Pass south slopes Jan., *Esterhuysen* 28781 (BOL); Near Crystal Pool, Garcias Pass, Oct., *Williams* 540 (BOL); Garcias Pass, Oct., *Bolus* 11361 (BOL, PRE); Riversdale, south slopes of the Langeberg, May, *Esterhuysen* 17015 (BOL); Garcias Pass, Oct., *Levy's* 2316 (CT); Sleeping Beauty Peak, July, *Dekenh* 3 (NBG); At the summit of Kampsche Berg, Jan., *Rourke* 250 (NBG). Above the waterfall at Garcias Pass, Dec. 2nd 1814, *Burchell* 6988 (K); Lower parts of the Langeberg at Garcias Pass, Dec. 1st 1814, *Burchell* 6955 (K).



PLATE 7.

Spatalla parilis Salisb. ex Knight. Stem bearing two inflorescences. Slightly larger than life size. Rourke. 284.



Map 24. Distribution of *Spatalla parilis* Salisb. ex Knight.

(12) *Spatalla barbiger*a Salisb. ex Knight in Knight, Cult. Prot. : 76 (1809).

Spatalla sericea R.Br. in Trans. Linn. Soc. Lond. **10** : 147 (1810).

Protea sericifolia Poir. in Lam., Encycl. Meth. Bot. Supp. **4** : 578 (1816).

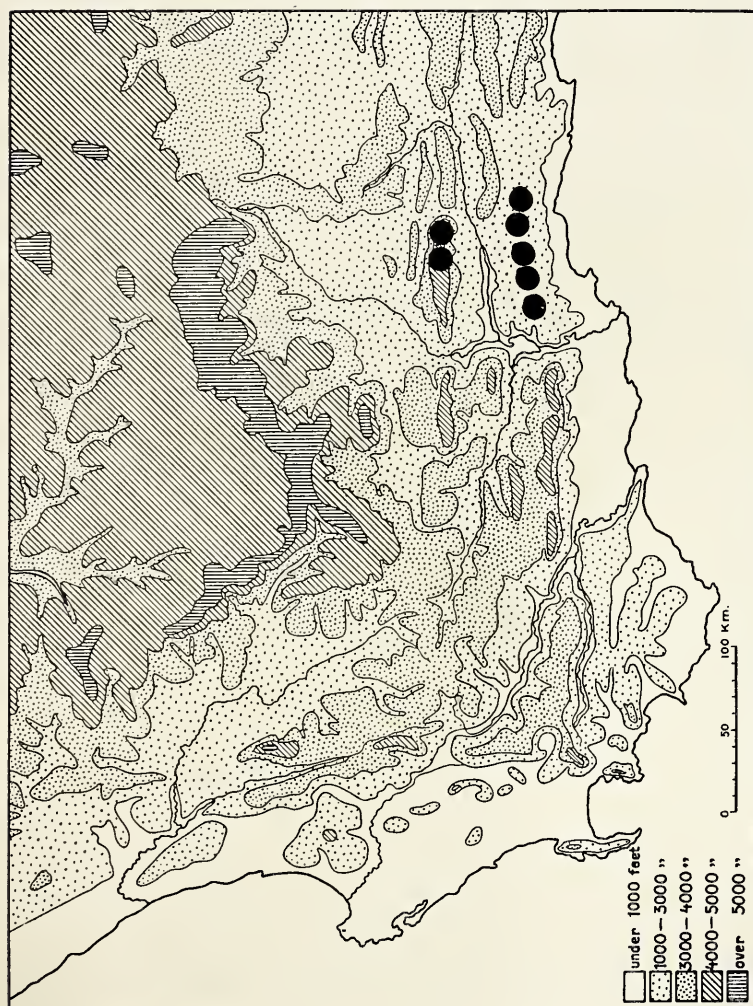
Spatalla burchellii Phillips, in Kew Bull. **1910** : 333 (1910).

An erect, rounded shrub to 0·75 m tall, with a strong main stem branching at 20 cms. *Branches* slender, terete, erect to ascending, covered with silvery grey imbricate leaves. *Leaves* acicular terete, 14—16 mm long, narrowing slightly to a petiolar region, somewhat incurved, with a permanent densely sericeous indumentum, apex mucronate. *Inflorescence* terminal, sessile or subsessile, narrowly cylindric, usually single and terminal, but occasionally with up to five lateral inflorescences arising round the base of main terminal inflorescence. *Bracts* acicular linear, 5—7 mm long, sericeous. *Involucres* one flowered, sessile or subsessile, pedicel not exceeding 1 mm. The three anticus bracteoles of the lower lip fused in their lower third, lanceolate acute, carinate, sericeous, 5 mm long, median bracteole slightly shorter. Posticus bracteole free, lanceolate acute, 5 mm long, sericeous. *Perianth* 7—9 mm long, strongly curved in bud, creamy yellow in live state. *Perianth segments* unequal, posticus segment erect, larger than the three anticus segments, distinctly galeate. Anticus perianth segments spreading forwards, lanate. *Perianth tube* 1·5 mm long, villous at top, glabrous below. *Anthers* sessile, ovate, 1 mm long, apical boss round, black. *Style* straight but curved at the top, 6 mm long. *Pollen presenter* an obliquely obovate, cochleariform disc. *Ovary* ovoid, 1 mm long, densely pubescent with long straight hairs. *Hypogynous scales* subulate linear, 1 mm long, hyaline. *Fruits* cylindric, 5—6 mm long densely villous, truncate and pedicellate at the base.

Diagnosis: *S. barbiger*a is distinguished by the permanently silvery-sericeous leaves, the sessile to subsessile single flowered involucres with lanceolate acute sericeous bracteoles, and the creamy to pale yellow coloured perianth.

Knight (1809), described *S. barbiger*a from material collected by Niven at George, the type of which is now at Kew. *S. sericea* R.Br. was described in the following year from a specimen without locality, collected by Roxburgh, now in the British Museum (photo of type in BOL), and which is clearly synonymous with *S. barbiger*a. The type of *S. burchellii* Phillips has also been examined and been found to be conspecific with *S. barbiger*a. Drège's collection of this species from the Swartberg, which is in a number of herbaria, was erroneously referred to the genus *Phylica* by E. Meyer, who gave it the manuscript name of *Phylica abietina* (in Drège Zwei Pfl. Docum. : 64, 210 (1844)).

Type Material: Platte Kloof (above George), Niven s.n., holotype in the herbarium of the Royal Botanic Gardens, Kew (K). (N.B., Platte Kloof on the Cradockberg above George has often been confused with Platte Kloof in the



Map 25. Distribution of *Spatalla barbigera* Salisb. ex Knight.

Riversdale district, the old pass over the Langeberg used by most of the early travellers.)

Distribution: This species is restricted to the south eastern Cape, from Mossel Bay to Knysna, and has also been recorded on the Swartberg, from Oudtschoorn to Meirings Poort. It is noteworthy that *S. barbiger* occurs on both the Outeniquas and the Swartberg as no other species in the genus is common to both the Langeberg-Outeniqua ranges, and the Swartberg, but is always confined to one or the other.

Ecology and Biology: A dense and rather luxuriant type of Cape sclerophyll covers the southern slopes of the Outeniquas in the George and Knysna districts and it is in this type of habitat that *S. barbiger* occurs most frequently. In contrast, the Swartberg habitat is decidedly drier. Rainfall differences between the two are considerable, 40—60" p.a. on the Outeniquas and 20—30" p.a. on the Swartberg, but despite this there are no significant morphological differences between the two populations. Flowering takes place from May to November, due to the succession of new inflorescences which arise laterally below the main terminal inflorescence as it fades.

Specimens Examined:

MOSSAL BAY: Robinson pass, June, *Compton* 19585 (NBG, BOL, PRE).

OUTDSHOORN: Southside of Swartberg pass, Nov., *Marloth* 2479 (PRE).; Swartberg pass, *Tugwell* s.n. (BOL 13992); Mountains above Meirings Poort, *Esterhuysen* 24841 (BOL).

PRINCE ALBERT: Swartberg near Klaarstroom, July, *Drège* 1839. (BOL, SAM, S).

GEORGE: Cradockberg near George, 11th Sept. 1814, *Burchell* 5899 (K, PRE); North of Cradockberg, *Dr. Thom* 505 (K, PRE); Hills around Montagu Pass, Nov., *Schlechter* 5831 (BOL, PRE, K, BM); Mountains around George, 7th Aug. 1847, *Alexander Prior* (K, PRE); Grootfontein, Langekloof, 2,000 ft., 22/1/1830, *Drège* 8078 (P); Cradock Peak, Jan., *Stokoe* s.n. (SAM 54735); Waboomskraal, north slopes of the Outeniquas, July, *Williams* 706 (NBG); Woodville forest reserve, Oct., *Rourke* 615 (NBG); March, *Williams* 911 (NBG).

KNYSNA: van der Walt's Hoek, Dec., *Keet* s.n. (STE 13157, BOL); Dec., *Keet* 981 (STE, PRE); Knysna, Dec., *Keet* 413 (BOL, PRE, STE).

WITHOUT PRECISE LOCALITY: Africa Australis, *Roxburgh* (BM); cap. b. spei, *Sieber* 1/471 (S).

(13) *Spatalla colorata* Meisn. in DC., Prodr. 14 : 308 (1856).

An erect sparsely branched shrublet to 0.75 m. *Branches* very slender when young, rather thin and straggly, almost completely glabrous, reddish. *Leaves* acicular terete, mucronate, thinly pilose, otherwise glabrous, 7—15 mm long. *Inflorescence* terminal, single, sessile, rounded to cylindric, up to 1.5 cm long, 1 cm broad. *Bracts* linear lanceolate, acute, 6 mm long, glabrous to sparsely pilose, margins long ciliate. *Involucres* single flowered, subsessile, pedicel not exceeding 1 mm in length. Bracteoles narrowly lanceolate acute, 3—4 mm long,

outer surface almost glabrous apart from a few scattered hairs, margins long ciliate. Anticous three bracteoles fused in their lower third, posticous bracteole free. *Perianth* 8—9 mm long, strongly curved in bud, deep carmine when fresh. *Perianth segments* unequal, posticous claw erect, longer and broader than the three anticous claws. Posticous limb galeate, broader and more densely woolly than the anticous limbs. *Perianth limbs* elliptic, 1 mm long, densely woolly. *Perianth claws* villous, becoming twisted on opening. *Perianth tube* glabrous, 1 mm long. *Anthers* broadly ovate, apical boss rounded, black. *Style* filiform, arising obliquely from the ovary, curved forwards at the apex. *Pollen presenter*, an obliquely obovate cochleariform disc. *Ovary* ovoid, 1 mm long, minutely puberulus. *Hypogynous scales* subulate linear, 1 mm long, yellow when fresh. *Fruits* cylindric ovoid, 4 mm long, slightly emarginate and broadly pedicellate at base.

Diagnosis: Apart from an occasional scattered hair on the bracteoles, the involucre is quite glabrous and is reddish to carmine and shiny in the living state. The glabrescence of the bracteoles together with the small size of the inflorescences (1.5 cm long), serve to distinguish *S. colorata* from the other sessile to subsessile involucre species with lanceolate acute bracteoles.

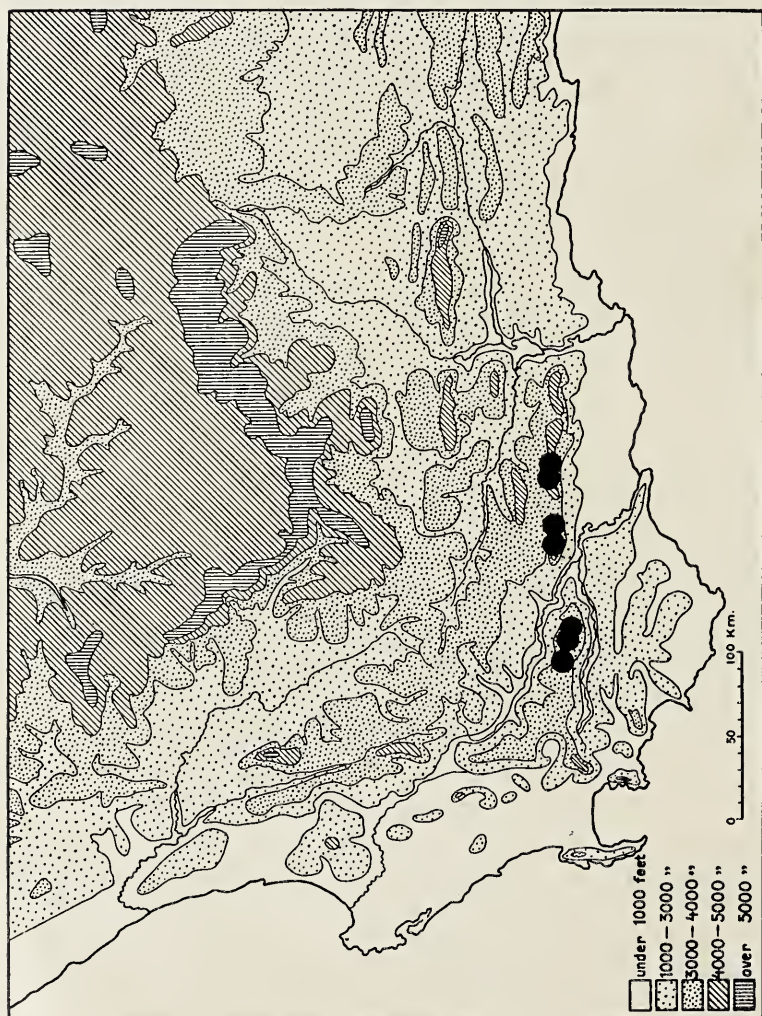
Only one collection was cited in the type description of this species by Meisner (1856). This is *Zeyher* 3718, of which there are duplicates in several herbaria. After examining the specimen bearing this number in Meisner's personal herbarium and comparing his notes on the sheet with the type description, it seems quite clear that this was the specimen used when he drew up the original description. Accordingly it has been selected to serve as the lectotype.

Type Material: In lapidosis montium, ad River Zonder Einde, alt, III, Sept., *Zeyher* 3718, lectotype in herb. Meisner, New York Botanical Gardens (NY). Isotypes are in the National Herbarium, Pretoria (PRE) and the South African Museum Herbarium, Kirstenbosch (SAM).

Distribution: This species occurs on the Riversonderend mountains and extends eastwards along the Langebergen as far as Lemoenshoek peak.

Ecology and Biology: *S. colorata* is a montane species, confined to the cool moist southern slopes of the Langebergen and Riversonderend ranges. It occurs at rather high altitudes, at least above 3,000 ft. and usually at 4,000 ft. where there is an adequate supply of moisture (rainfall 30—40" p.a.) distributed more or less evenly throughout the year, but with a slight winter maximum. Never common at any one locality, the plants are seen occurring as scattered individuals. Young plants regenerating after burning tend to have very thin wiry stems.

Older specimens become more woody and straggly, the leaves falling from the lower branches leaving the stems bare apart from tufts of rather closely arranged leaves at the branch apices. Flowers are produced from July to November.



Map 26. Distribution of *Spatalla colorata* Meisn.

Specimens Examined:

CALEDON: Riversonderend mountains, Zeyher 3718 (NY, SAM, PRE); Barnard 426 (SAM); Riversonderend peak, Oct., Stokoe s.n. (SAM 9375, SAM 9253).

SWELLENDAM: Zuurbraak peak, Oct., Barnard s.n. (SAM 28997); Swellendam mountains, Oct., Barnard s.n. (SAM 28996); Goedgekloof mountains, July, Wurts 223 (NBG).

HEIDELBERG: Lemoenshoek peak, Sept., Esterhuysen 10477 (BOL); Jan., Walgate 937 (BOL); Oct., Rourke 639 (NBG).

(14) *Spatalla prolifera* (Thunb.) Salisb. ex Knight, in Knight Cult. Prot : 75 (1809).

Protea prolifera Thunb., Diss. Prot. : 29 tab. 4 (1781).

An erect, slender, sparsely branched shrublet, to 1 m tall. *Branches* very slender, flexuous, covered with densely imbricate terete leaves. *Leaves* linear terete, filiform, mucronate, 10–30 mm long, sparsely pilose when young, soon glabrous. *Inflorescence* single, terminal and sessile, globose to subglobose, 1–2 cm in diam., a congested but few flowered raceme. *Bracts* linear lanceolate, acuminate, 5–8 mm long, sericeous, margins ciliate. *Involucres* single flowered, sessile. *Bracteoles* of equal size, free, lanceolate, acute to acuminate, sericeous to glabrous, margins ciliate, 3–5 mm long 0.5–1 mm broad. *Perianth segments* unequal, posticous segment longer and broader than the three anticus segments. *Perianth claws* villous, the three anticus claws curved forwards, posticous claw erect. *Perianth limbs* lanceolate to elliptic, densely villous, posticous limb galeate. *Perianth tube* glabrous, 1–2 mm long, occasionally inflated. *Anthers* sessile, ovate, 0.5–1 mm long, apical boss very poorly developed, almost absent. *Style* straight, 7 mm long, curved forwards in the apical region. *Pollen presenter* an obliquely conical to obovate cochleariform disc. *Hypogynous scales* subulate, hyaline, 1 mm long. *Fruits* cylindric ovoid, 4 mm long, 1 mm in diam., puberulous, broadly pedicellate at the base.

Diagnosis: *S. prolifera* may be distinguished from the other species of *Spatalla* with sessile inflorescences and sessile one flowered involucres, by its free, narrowly linear lanceolate bracteoles.

Type Material: South Africa, without precise locality, Thunberg, sheet 2961 in Herb. Thunberg (UPS), holotype.

Distribution: This species is very restricted in its distribution and appears to be confined to the Palmiet River valley.

Ecology and Biology: *S. prolifera* is an unusual species in that it is an inhabitant of swamps, wet marshy ground, and riversides. Flowers are produced from September to December.

Specimens Examined:

CALEDON: Viljoens Pass, Nov., *Acocks and Hafstrom* 401 (PRE); Top of Viljoens Pass, Oct., *Hutchinson* 1073 (BOL, PRE); Palmiet River mts., Oct., *Marloth* 6238 (PRE); Kleinmond, in swamps. *Siokoe* 1284 (PRE); Viljoens Pass, Oct., *Marloth* 13206 (PRE); Palmiet



Map 27. Distribution of *Spatalla prolifera* (Thunb.) Salisb. ex Knight.

River, Dec., *Stokoe* 939 (PRE); Mountains above Steenbras reservoir, Feb., *Galpin* 12562 (PRE); Palmiet River valley, *Stokoe* 6535 (PRE, NY); Viljoens Pass, Oct., *Wedermann and Oberdieck* 393 (PRE); Marsh N.W. slopes of Steenbras reservoir, Feb. *Salter* 4337, (PRE, BOL); Kogelberg Reserve, *van der Merwe* 7000 (PRE); Hottentots Holland, Dec., *Zeyher and Pappe* (SAM 43715); Steenbras, damp places, Oct., *Pillans* 2265 (SAM, BOL); Oudebos, Palmiet River valley, Dec., *Stokoe* s.n. (SAM 65149); North west of Steenbras reservoir, Dec., *Salter* 5127 (SAM); Palmiet River valley, *Stokoe* s.n. (SAM 28833); Kogelberg, March, *Compton* 19407 (NBG); Marshy ground, Kogel bay, Oct., *Stokoe* s.n. (BOL 17481); Palmiet River valley, July, *Stokoe* s.n. (BOL 17730); Marsh on Viljoens Pass, Dec., *Salter* 5193 (BOL); Damp places on banks of Palmiet River, Jan., *Stokoe* 939a (BOL).

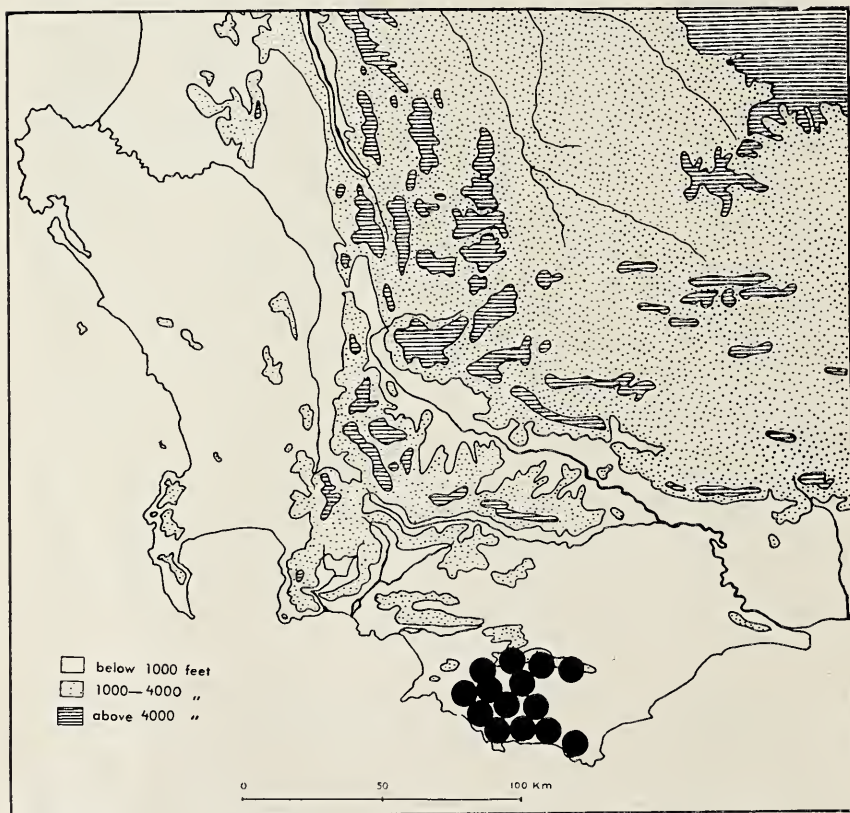
WITHOUT PRECISE LOCALITY: Promont. bona spei *Dr. Roxburgh* 8 (G); Cap. b. spei, *Thunberg*, sheet no. 2961 in herb. Thunberg (UPS); Prom. bon. spei, Masson (K).

(15) *Spatalla squamata* Meisn. in DC. Prodr. **14** : 310 (1856); Hutchinson in Hook. Icon. Plant. **31** : tab. 3044 (1915).

A small, much branched, rounded shrub to 0·5 m tall, main stem stout. Branches slender, terete, erect, glabrous, densely clothed with fine imbricate leaves, Leaves linear terete, mucronate, slightly incurved at the tip, glabrous, 5—12 mm long. Inflorescence sessile, single, cylindric to globose, 2—3 cm long, 1 cm in diam. Bracts linear lanceolate, carinate, 5—7 mm long, margins ciliate, outer surface pilose to glabrous. Involucres sessile, one flowered, large and conspicuous, 7 mm long 4 mm broad, differentiated into a distinct upper and lower lip. Lateral bracteoles of lower lip ovate acute, median anticus bracteole smaller, ovate acute, pubescent on the inner surface. Posticus bracteole broadly ovate acute. Involucre glabrous or nearly so. Perianth 8 mm long, the densely lanate limbs curved at right angles to the claws when in bud. Perianth carmine in live state. Perianth segments unequal, posticus segment longer and broader than the three anticus segments. Perianth limbs ovate acuminate, very densely lanate, posticus limb galeate. Perianth claws 7—8 mm long, outer surface puberulous with thin crisped hairs, inner surface densely pubescent, crisped. Perianth tube 1—1·5 mm long, glabrous, narrowing slightly towards the base. Anthers ovate, apical boss pointed, yellowish. Style 7—8 mm long, curved forwards at the tip. Pollen presenter an obliquely obovate cochleariform disc. Ovary ovoid 1 mm long, sericeous. Hypogynous scales linear subulate, hyaline, 1 mm long. Fruits cylindric, 5 mm long, truncate and pedicellate at the base, minutely puberulous.

Diagnosis: This species may be recognised by the sessile inflorescences, the dense crisped pubescence on the inner surface of the perianth claws, and the large, sessile, glabrous to near glabrous single flowered involucres. When the flowers have dropped, the glabrous, membranous bracteoles of the involucres enlarge conspicuously and develop reddish—carmine tints. The specific name “squamata” almost certainly refers to these scaly bracteoles.

In his type description, Meisner specifically states that the specimen used for the description was "Ludwig s.n., circa Elein (Elim) in herb. reg. Stuttgart". Therefore this specimen must be the holotype. However, Mr. I. Williams has informed me that he was unable to trace any material of the South African Proteaceae when he visited the Stuttgart herbarium in connection with his research on *Leucadendron* in 1965. It would appear that during the last war these specimens were either lost or destroyed. Fortunately, Meisner obtained a duplicate of this specimen which is now in the Meisner herbarium, New York (NY), and is annotated in his own hand. This specimen has been chosen to serve as the lectotype.



Map 28. Distribution of *Spatalla squamata* Meisn.

Type Material: South Africa, near Elim, *Ludwig* s.n., lectotype in herb. Meisner, New York Botanical Gardens (NY).

Distribution: This species is restricted to the coastal belt of the Bredasdorp district.

Ecology and Biology: *S. squamata* occurs only on the sandy and stony hills of the Bredasdorp district at elevations of 100—1,500 ft., where it receives a winter rainfall of 15—20" p.a. It is apparently confined to soils that are acidic and are derived from Table Mountain sandstone. The plants occur as scattered individuals in open heathy country. There is a well defined flowering period, from August to October. By December, most of the flowers have dropped, and the bracteoles of the involucrens enlarge conspicuously, becoming more membranous and bright carmine in colour. These brilliantly coloured involucrens persist during the summer months even after the fruits have been released.

Specimens Examined:

BREDASDORP: Viljoenshof, hills above Koks River, Oct., *van Breda* 1745 (PRE); Brandfontein, Sept., *C. A. Smith* 3134 (PRE); Koudeberg, Sept., *Williams* 911 (NBG); Elands Kloof mts., Koudeberg area, Sept., *Rourke* 574 (NBG); Between Waterford and Wolwegat, Sept., *Rourke* 573 (NBG); South slopes of Zoetanyenberg, *C. A. Smith* (PRE 5043); Hill side at Elim, Dec., *Galpin* 11201 (PRE); Top of Bredasdorp mountain, Dec., *Galpin* 11320 (PRE, BOL); Hills near Koude River, Dec., *Schlechter* 9612 (BOL, PRE); Between Elim and Stanford, Sept., *M. C. Gillet* 4353 (PRE, SAM, NBG); Plateau on Bredasdorp mtn. Dec., *Galpin* 11321 (PRE); Elim, Sept., *Compton* 3392 (BOL); Elands Kloof mtns. Sept., *Salter* 4852 (BOL, SAM); Hills around Elim, Oct., *Bolus* 7866 & 7867 (BOL); Brandfontein, Oct., *Esterhuysen* 19060 (BOL); Baardscheedersbosch, Dec., *Leighton* 2589 (BOL); Elim, Sept., *Lewyns* 2157 (CT); Hagel Kraal, Jan., *Lewis* 2527 (SAM); Springfield estate, Sept., *Davis* and *Stokoe* s.n. (SAM 62151); Baardscheedersbosch, Dec., *Compton* 19018 (NBG); Elim, *Ludwig* s.n. in herb. Meisner (NY); Soetanyenberg, north slopes, Dec., *Rourke* 1019 (NBG).

(16) *Spatalla ericoides* Phillips, in Kew Bull. 1910 : 334 (1910).

An erect, rounded, laxly branched shrub to 75 m tall with a single slender main stem. Branches slender, slightly flexuose, villous when young, glabrous later. Bark reddish purple. Stems covered with closely adpressed imbricate leaves. Leaves subterete, flattish on the upper surface, slightly incurved towards the tip, apiculate, sparsely villous on upper surface when young, soon becoming glabrous, 7—12 mm long. Inflorescence single, terminal, sessile, cylindric, up to 3 cm long, 1.5 cm broad, a dense raceme. Involucrens sessile, subtended by a membranous, narrowly lanceolate acute bract, villous on the outer surface, carmine when fresh. Involucrens 6 mm long, consisting of a distinct upper and lower lip. Anticous lip composed of three bracteoles, fused in their lower two thirds. Lateral bracteoles ovate acute, the median bracteole ovate acute, smaller than the two laterals, with a thick line of hairs extending up the inner surface. Posticous bracteole ovate acute. Outer surface of bracteoles thickly silky villous, reddish carmine when fresh. Perianth 10 mm long, strongly curved in bud.

Perianth segments unequal, posticous segment longer and broader than the three anticus segments. *Perianth limbs* elliptic, densely woolly, posticous limb erect, galeate. *Perianth claws* sparsely pubescent with short crisped hairs, pubescence decreasing to almost glabrous towards the perianth tube. Inner surface of perianth claws densely pubescent with shaggy crisped hairs. *Perianth tube* glabrous, 1 mm long. *Anthers* broadly elliptic, apical boss black, pointed. *Style* 7 mm long, curved forwards towards apex. *Pollen presenter*, an obliquely obovate cochleariform disc, pink in fresh state. *Ovary* ovoid, 1 mm long, slightly pubescent at the apex, otherwise glabrous, style arises obliquely from the ovary. *Hypogynous scales* linear, 1 mm long, hyaline to white when fresh. *Fruits* cylindric oblong, 5 mm long, truncate and minutely pedicellate at base, greyish brown, very sparsely puberulous to glabrous.

Diagnosis: The sessile, thickly silky villous involucres distinguish *S. ericoides* from *S. squamata*, which has glabrous involucres. Apart from their dense pubescence, the bracteoles do not enlarge and become brightly tinted after pollination as in *S. squamata*.

Type Material: *S. ericoides* was described in 1910 by Phillips from a single specimen, without collector or locality, in the South African Museum herbarium, Kirstenbosch (SAM 43707).

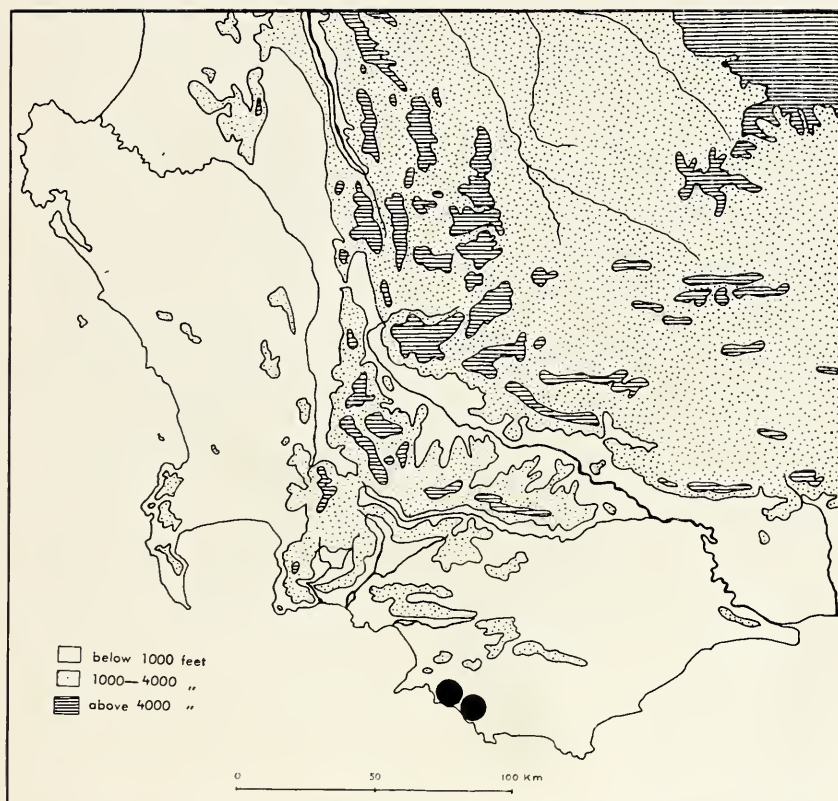
Distribution: Bredasdorp district, hills near the coast between Kleyn Hagel Kraal above Pearly Beach, and Hagel Kraal, a few miles further east, up the coast. Our knowledge of this species was very meagre indeed until August 1966, when by chance the present author discovered two populations along the Bredasdorp coast. Previously it had been known only from specimens obtained at wild flower shows, all without localities.

Ecology and Biology: The coastal region of the Bredasdorp district is notable for the Tertiary limestone outcrops of the Alexandria formation which form a prominent ridge of hills adjacent to the sea. Although not growing directly on the limestone, *S. ericoides* occupies the sandy patches in between the limestone outcrops. It is probably significant that to date, this species has only been seen growing in close association with the limestone formations and has not been observed away from this particular habitat.

Specimens Examined:

BREDASDORP: Kleyn Hagel Kraal, above Pearly Beach, Aug., *Rourke* 537 (NBG); Hills above Hagel Kraal, Aug., *Rourke* 538 (NBG).

WITHOUT PRECISE LOCALITY: Caledon wild flower show, Sept., *Pillans* s.n. (BOL); Cape Town flower show, Oct., (BOL 17277); Without collector or locality, Oct., (SAM 43707); Cape Town flower show, Oct., (SAM 25263); Without collector or locality, in herb. Kew (K).



Map 29. Distribution of *Spatalla ericoides* Phillips.

(17) *Spatalla longifolia* Salisb. ex Knight in Knight, Cult. Prot. : 77 (1809).

Spatalla bracteata R.Br. in Trans. Linn. Soc. Lond. **10** : 145 (1810).

Protea bracteolaris Poir. in Lam., Encycl. Meth. Bot. Supp. **4** : 578 (1816).
Nom. illegit.

Spatalla cylindrica Phillips in Kew Bull. **1910** : 334 (1910).

An erect, rounded, rigid shrub to 1 m tall, main stem stout and woody, branching at 20 cms. *Branches* erect, stout, terete, 2—4 mm in diam., pubescent when young, soon glabrous. *Leaves* acicular terete, mucronate, straight or

slightly incurved, upper surface canaliculate, 25–45 mm long, narrowing to a slender petiolar region, thinly villous when young, soon glabrous. *Inflorescence* pedunculate, terminal, single, peduncle 2–3 cm long; inflorescence a narrowly cylindric raceme, 3–10 cm long, 1.5 cm in diam. *Bracts* linear terete, canaliculate, 8–15 mm long, glabrous to sericeous. *Involucres* one flowered, pedicellate, pedicel 4–5 mm long, sericeous. The three anticus bracteoles of the involucre lanceolate acute, fused in their lower third, sericeous, 3 mm long. Posticus bracteole lanceolate acute, free, 3–4 mm long, sericeous, margins ciliate. *Perianth* 8–9 mm long, greyish pink in live state. *Perianth segments* unequal, posticus segment erect and galeate, larger than the three anticus segments, anticus segments spreading forwards. *Perianth claws* villous, the three anticus claws with a swelling of glandular tissue near the base, carmine when fresh; swelling absent from posticus claw. *Perianth limb* elliptic, 1 mm long, densely villous. *Perianth tube* very short, 0.75–1 mm long, glabrous. *Anthers* sessile ovate, apical boss black, rounded. *Style* straight, 6 mm long, curved forward at the top. *Pollen presenter* an obliquely obovate cochleariform disc. *Ovary* ovoid, 1 mm long very densely sericeous. *Hypogynous scales* subulate linear, 1 mm long yellow. *Fruits* cylindric, 5–6 mm long, 2 mm in diam., sericeous, truncate and prominently pedicellate at the base.

Diagnosis: The pedunculate inflorescence, the long (25–45 mm), straight leaves, canaliculate on the upper surface and narrowing towards the base, and the single flowered pedicellate involucre with villous, lanceolate acute bracteoles fused in their lower third, are the chief distinguishing characters. In the fresh state this species is easily recognised by the rather greyish pink perianth segments and the carmine coloured swellings of glandular tissue on the inner surface of the base of the three anticus perianth claws. When dried, the foliage turns black very quickly and does not retain a greenish colour as in the case of most other species.

Knight (1809), published the first description of this species citing Niven's collection from French Hoek as his type. A specimen in the British Museum collected by Roxburgh and labelled "*Spatalla bracteata* Africa australis", in Brown's handwriting can be taken as the type of *S. bracteata* R.Br., which is conspecific with *S. longifolia*. Nevertheless, it is possible that Niven 37 was also used by Brown when he described *S. bracteata* for although Brown does not cite a particular specimen as his type, he quotes Niven's field notes in the type description. These same details are quoted by Knight in his description, which seems to indicate that both must have examined specimens of the same collection.

S. cylindrica, described by Phillips in 1910 must also be reduced to synonymy. This species was based on two collections, viz. Burchell 8212 and Schlechter

7230, iso-syntypes of which have been examined in the National herbarium, Pretoria, and the Bolus herbarium respectively.



Map 30. Distribution of *Spatalla longifolia* Salisb. ex Knight.

Type Material: James Niven made the type collection "near rivulets at Franch Hoek", *Niven* 37, holotype in the herbarium of the Royal Botanic Gardens Kew. An isotype is in the National Herbarium, Pretoria (PRE).

Distribution: Restricted to the south slopes of the Hottentots Holland mountains and the Kogelberg forest reserve.

Ecology and Biology: *S. longifolia*, unlike the related *S. curvifolia*, is usually a solitary species, and seldom are two or more individuals seen growing together. Although confined to a region of high winter rainfall (40—75" p.a.) it shows a marked preference for rocky well drained slopes on hills of Table Mountain sandstone, between 1,000 and 3,000 ft.; not recorded below this. There is a very well defined flowering period, from August to November, which is in contrast to *S. curvifolia*, a species that flowers continuously throughout the year.

Specimens Examined:

STELLENBOSCH: Franch Hoek kloof, *Niven* 37 (K, PRE).

SOMERSET WEST: Mountains of Sir Lowry's Pass, 25th March 1815, *Burchell* 8212 (K, PRE); Sir Lowry's Pass, Jan., *Schlechter* 7230, (BOL, PRE, G, K, BM); Somerset Sneeuwkop, S.E. slopes, Nov., *Stokoe* 8589 (BOL).

CALEDON: Kleinmond, Sept. *Stokoe* 6570 (BOL); Nov. *Stokoe* s.n. (BOL); Palmiet river, Jan. *Stokoe* 938 (PRE); Viljoens drift, Elgin, *Stokoe* (PRE 27057, SAM); Paardeberg, Dec. *Grobler* 0113 (PRE); Nov., *M. Cloete* s.n. (SAM 60966); Nieuweberg forest reserve, May (in fruit), *Rourke* 420 (NBG); Hottentots Holland, 22nd Sept. 1846, *Alexander Prior* (K); Kogelberg, north western slopes, Nov., *Rourke* 986 (NBG).

WITHOUT PRECISE LOCALITY: Prom. bon. Spei, *Roxburgh* (G); Without collector, in herb Burman (G); Without collector or locality, sheet 116. 15 (LINN); Africa australis, *Roxburgh* (BM).

(18) *Spatalla curvifolia* Salisb. ex Knight in Knight, Cult. Prot. : 77 (1809).

Spatalla nivea R.Br. in Trans. Linn. Soc. Lond. **10** : 145 (1810).

Spatalla pedunculata R.Br. in Trans. Linn. Soc. Lond. **10** : 144 (1810).

Protea nivea (R.Br.) Poir. in Lam., Encycl. Meth. Bot. Supp. **4** : 578 (1816).

Protea pedunculata (R.Br.) Poir. in Lam., Encycl. Meth. Bot. Supp. **4** : 578 (1816).

Spatalla galpinii Phillips in Kew Bull. **1910** : 334 (1910).

A low rounded much branched woody shrublet, to 0.75 m tall. *Branches* erect, terete, pilose to glabrous. *Leaves* acicular terete, narrowing to a slender petiolar region, canaliculate on the upper surface, thinly sericeous to glabrous, bluntly mucronate, straight to strongly incurved, 2.5—5 cm long. *Inflorescence* terminal or axillary, pedunculate, peduncle 1—7 cm long. Inflorescence a dense many flowered cylindric raceme, 3—7 cm long, 1—1.5 cm in diam. *Bracts* acicular terete 2—11 mm long. *Involucre*s one flowered, pedicellate, composed of a distinct anticus and posticus lip, tightly clasping the perianth. Posticus

bracteole ovate acute, fused to the anticus lip at the base only. Anticus lip scarcely trifid, composed of three almost entirely fused bracteoles. *Bracteoles* sericeous to velutinous, 3—4 mm long. *Perianth* strongly curved forward in bud, creamy white or pale yellowish in fresh state, 7—9 mm long. *Perianth segments* unequal, posticus segment larger and broader than the three anticus segments, erect and galeate. *Perianth limbs* elliptic, acute thickly villous, posticus limb galeate. *Perianth claws* villous, the three anticus claws twisting below the limb region, with a reddish swelling of glandular tissue at the base of the inner surface of the three anticus limbs. *Perianth tube* glabrous, 1—1.5 mm long, cylindric. *Anthers* elliptic with a black apical boss. *Style* slender, straight, slightly laterally flattened, 7 mm long. *Pollen presenter* an obliquely obovate cochleariform disc, deep purple when fresh. *Ovary* ovoid, 1 mm long, very densely sericeous. *Hypogynous scales* subulate, 1 mm long, bright yellow. *Fruits* cylindric, 6—7 mm long, apex beaked, truncate and pedicellate at the base.

Diagnosis: This species is distinguishable by the pedunculate inflorescence, the acicular terete leaves canaliculate on the upper surface and which narrow to a slender petiolar region, the scarcely trifid lower lip of the involucre and the reddish to carmine coloured fleshy swellings at the base of three anticus perianth claws.

Knight (1809) applied the name *S. curvifolia* to a specimen collected by Niven in the Hottentots Holland mountains, the type of which is at Kew and was examined when on loan to the Bolus herbarium. The following year Brown described *S. pedunculata* and *S. nivea* from specimens which are now preserved in the British Museum. Photographs of these types were supplied by courtesy of the Keeper of Botany, British Museum, from which it has been possible to establish that these two species are synonymous with *S. curvifolia*. Phillips (1910) described a further species, *S. galpinii*. After an examination of the syntypes this has also proved to be conspecific with *S. curvifolia*. It would appear that Phillips had a rather confused concept of his own species since the specimen (*Stokoe* s.n. PRE 27057) from which plate 889 in "The Flowering Plants of South Africa" was painted, is not *S. galpinii* as it was identified by Phillips, but *S. longifolia*.

Type Material: Hottentots Holland mountains, *J. Niven* 36, holotype at. Kew (K), isotype in herb. J. E. Smith (Linn).

Distribution: This fairly widespread species occurs from Steenbras southwards through the Kogelberg reserve, Betty's Bay and Hangklip, to Hermanus and Bredasdorp. It has also been recorded from the Bosjeveld range above Genadendal.

Ecology and Biology: *S. curvifolia* is probably the most commonly encountered species in the genus. It always occurs on well drained, sandy or rocky slopes derived from Table Mountain sandstone. The altitudinal range is small,



PLATE 8.

Spatalla curvifolia Salisb. ex Knight. To show the phenomenon of continuous flowering. Young inflorescence buds at various stages of development can be seen arising in an axillary position below older inflorescences at stages varying from half opened, to faded, to fruiting. Life size.

some populations growing at sea level within a few hundred yards of the sea, while others inhabit mountain slopes up to 1,000 ft. Unlike the related *S. longifolia*, *S. curvifolia* tends to grow socially in small colonies.

It is difficult to specify a definite flowering season for there is a continuous succession of inflorescences reaching maturity on the plant throughout the year. This habit of continuous flowering occurs in only two species of *Spatalla*, *S. parilis* and *S. curvifolia*. In these species the main terminal inflorescence terminates an actively growing branch. Each inflorescence contains up to 150 flowers. The lowermost open first and as the inflorescence steadily elongates there is a regular succession of flowers opening upwards, the whole process taking about one month. As the main terminal inflorescence fades, lateral inflorescences at different stages of development, arise in the axils of the leaves below it and begin to open in a regular sequence. This process is repeated continuously and hence it is possible to collect material in flower, in fruit and in bud on the same plant at any time of the year. Despite the abundance of flowers produced, few fruits per inflorescence ever come to maturity. On an inflorescence bearing 150 flowers it is very unusual to find more than 3 fertile fruits. This appears to be compensated for by the process of continuous flowering for the annual yield of fruits per plant is quite high.

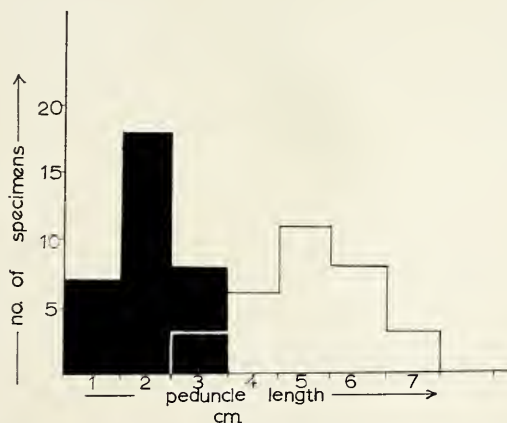


FIG. 21: *Spatalla curvifolia*. The histograms showing variation in peduncle length are based on measurements taken from 60 specimens, 30 from localities east of the Bot river (blackened area) which have short peduncles, and 30 from localities west of the Bot river (blank area) which have considerably longer peduncles.



PLATE 9.

Spatalla curvifolia Salisb. ex Knight. A selection of specimens showing the gradation between forms with strongly incurved leaves and forms with almost straight leaves. Natural size.

Variation: Peduncle length varies considerably but it is possible to distinguish two broad groups within the species. (See fig. 21.) (1) Specimens from localities east of the Bot river including Hermanus, Bredasdorp and Swartberg (Caledon), have peduncles not exceeding 3 cm in length. (2) Specimens from localities west of the Bot river including Rooi Els, Hangklip, Betty's Bay and the Kogelberg Reserve, have peduncles that are markedly longer, ranging from 3–7 cm in length. However, in view of the overlap between these two groups the recognition of varieties based on peduncle length is considered to be inadvisable.

Knight's type is a specimen with very strongly incurved leaves and in the past the epithet "curvifolia" has only been applied to specimens matching the type. In the field there is much variation in this character, even within a single population. The leaves may be straight or very strongly incurved with a wide range of intermediates. Forms with strongly incurved leaves appear at random and cannot be localised geographically. (See Plate 9.)

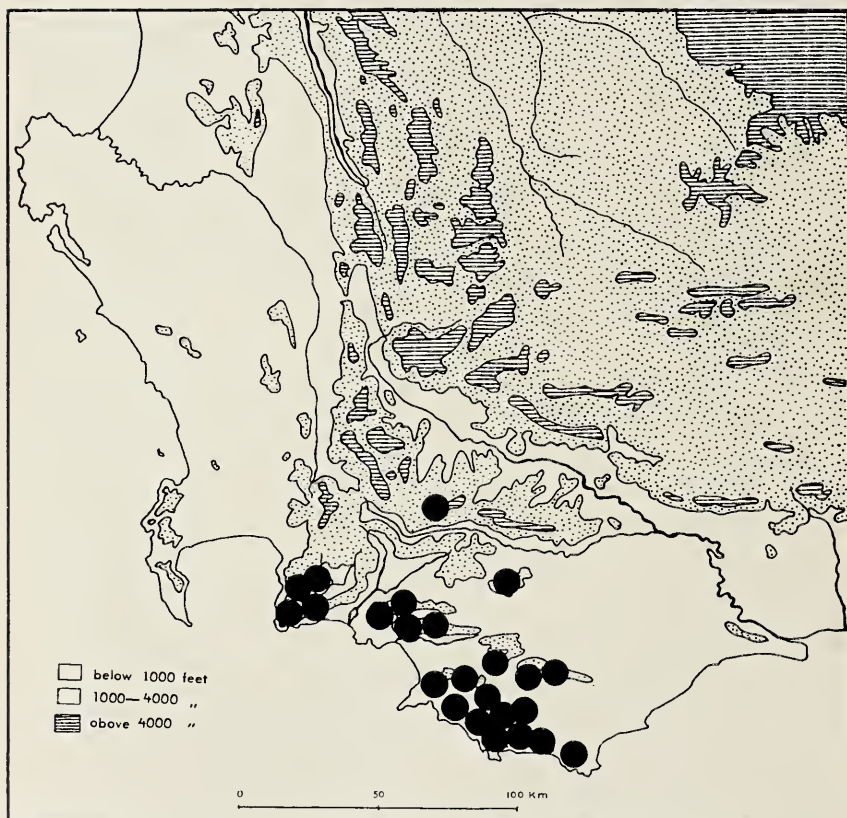
Specimens Examined:

CALEDON: Hills at Palmiet river mouth, Jan., *Pillans* 8209 (BOL, PRE); Caledon, Oct., *A. Prior* s.n. (PRE 29739); Houwhoek mts., *Zeyher* 3721b. (PRE); Hermanuspetrusfontein, Oct., *Galpin* 4485 (PRE); Palmiet river mouth, April, *Andreae* 893 (PRE); Klein river, Sept., *Schlechter* 7608 (PRE); Mossel River, Hermanus, Oct., *Martin* 553 (NBG, BOL, PRE); Between the Palmiet River and Sir Lowry's Pass, *Burchell* 8179 (PRE); Forest reserve between Elgin and Kleinmond, Jan., *Levyns* 7031 (CT); Betty's Bay, Feb., *Levyns* 11507 (CT); Rooi Els, Oct., *Levyns* 10358 (CT); Zwartberg, near Caledon, Oct., *Pappe* s.n. (SAM 19823); Steenbras, Sept., *Stokoe* s.n. (SAM 56364); Hottentots Holland, Oct., *Pappe* s.n. (SAM, PRE); Palmiet River valley, Jan., *Stokoe* s.n. (SAM 58913); Above Rooi Els, Oct., *Parker* 4665 (SAM, NBG, PRE); Oudebos, Palmiet River mts., Dec., *Stokoe* s.n. (SAM 66201); Gansbaai, *Rabinowitz* s.n. (SAM 62145); Klein River mts., April, *Stokoe* s.n. (SAM 6620); Betty's Bay, *L. E. Taylor* 4373 (NBG); Near Palmiet River, *Vogts* 44 (NBG, PRE); Between Rooi Els and Pringle Bay, Nov., *Parker* 4459 (NBG, BOL); Hangklip, Oct., *Compton* 22150 (NBG); South east slopes of Babylon's Tower, Feb., *Esterhuysen* 4983 (BOL, NBG); Voelklip, Sept., *Barker* 1706 (NBG); Fern Kloof mts., Sept., *Williams* 890 (NBG); Swartberg, Caledon, Jan., *Bolus* 7420 (BOL); Nov., *Zeyher* 3721 (BOL); Genadendal, Dec., *Bodkin* 3591 (BOL); Onrust River mts., Nov., *Esterhuysen* 4255 (BOL); Hemel en Aarde, Jan., *M. C. Gillet* 560 (BOL); Rocklands Peak, Hermanus, Jan., *Esterhuysen* 26964 (BOL); Rooi Els Peak, Jan., *Esterhuysen* 28204 (BOL); Between Rooi Els and Louwsbos, March, *Esterhuysen* 29033 (BOL); Mountains near Mossel River, Jan., *L. Guthrie* 17589 (BOL); Kleinmond, Jan., *M. C. Gillet* 590 (BOL); Palmiet River, Elgin, Feb., *Stokoe* 8590 (BOL); Pringle Bay, Jan., *Compton* 6128 (NBG, BOL); Palmiet River mouth, Jan., *Compton* 6099 (NBG); Hermanus mts., Sept., *Stokoe* 9557 (PRE); Kogelberg, Feb., *Vogts* 70 (PRE); Zwartberg, Caledon, *Ludwig* s.n. in herb Meisner (NY); Lower slopes of Voorberg at Sunny Seas, Jan., *Rourke* 81 (NBG); Between Silversands and Stony Point, Jan., *Rourke* 82 (NBG).

BREDASDORP: Bredasdorp, mountain slopes, Nov., *Galpin* 15053 (PRE); South slopes of Bredasdorp mtn., Dec., *Acocks* and *Hafstrom* 2118 (PRE); On the road to Elim, Sept., *M. C. Gillet* 4352 (NBG, PRE); Ratel River estate, Oct., *Van Breda* 1462 (PRE); Between Elim and Hagedisberg Pass, Oct., *Levyns* 8437 (CT); Bredasdorp, hills behind town, *Levyns* 2137 (CT); Hagel Kraal, Jan., *Lewis* 2599 (SAM); Road to Pearly Beach, June, *Maguire* 37 (NBG); Baardscheedersbosch, Dec., *Compton* 19017 (NBG); Hagel Kraal, Jan., *Compton* 20434 (NBG); Bredasdorp hills, Oct., *Bolus* 7869 (BOL, PRE); Viljoenshof, hills at "Koksriver", Oct., *Van Breda* 1744 (PRE); Ratel River estate, March, *Van Breda* 1538 (PRE); Hills near Elim, Dec., *Bolus* 8594 (BOL); Danger Point, Jan., *Leighton* 1583 (BOL, NY); Three miles west of Elim, Sept., *Salter* 4851 (BOL); Baardscheedersbosch,

Dec., *Leighton* 2586 (BOL, NY); Sondags Kloof, July, *Williams* 790 (NBG); Sandies Glen, May, *Williams* 737 (NBG); On the Pearly Beach road, turn off to Waterford, *Williams* 917 (NBG); Hills above Hagel Kraal, Sept., *Rourke* 528 (NBG).

WITHOUT PRECISE LOCALITY: Cap. b. *Spei*, *Thunberg*, in herb *Swartz* (S).



Map 31. Distribution of *Spatalla curvifolia* Salisb. ex Knight.

(19) *Spatalla racemosa* (L.) Druce in Rep. Bot. Exch. Cl. Brit. Isles 1913, (3) : 424 (1914).

Leucadendron racemosum L., Sp. Pl. ed. 1 : 91 (1753).

Protea racemosa L., Mant. Alt. : 187 (1771).

Spatalla gracilis Salisb. ex Knight in Knight, Cult. Prot. : 77 (1809). Nom. illegit.

Spatalla ramulosa R.Br. in Trans. Linn. Soc. Lond. **10** : 145 (1810). Nom. superfl., pro parte.

Spatalla laxa R.Br. in Trans. Linn. Soc. Lond. **10** : 146 (1810).

Protea laxa (R.Br.) Poir. in Lam., Encycl. Meth. Bot. Supp. **4** : 578 (1816).

A small, slender, laxly branched shrublet to 0.5 m tall, with a single main stem. *Branches* erect, very slender, terete, lax, bark reddish and glabrous. *Leaves* acicular terete, 15–35 mm long, mucronate, narrowing to a slender petiolar region, canaliculate on the upper surface. *Inflorescence* a lax cylindric raceme, 1–3 cm long, pedunculate, peduncle 1 cm long. *Bracts* subulate, 1–2 mm long, sericeous. *Involucres* single flowered, pedicellate, pedicel 4–5 mm long, sericeous. The three bracteoles of the lower lip ovate acute, fused for two thirds of their length, posticous bracteole ovate acute, free, sericeous. *Perianth* 7 mm long, strongly curved forward in bud. *Perianth segments* unequal, posticous segment larger and more thickly sericeous than the three anticus segments. *Perianth claws* thickly sericeous to lanate, the three anticus claws spreading forwards, posticous claw erect. *Perianth limbs* ovate, lanate, posticous limb very strongly galeate. *Perianth tube* cylindric, 2 mm. long, glabrous at the base, slightly sericeous above. *Style* straight, 5 mm long, slightly laterally compressed and minutely canaliculate on the anterior surface. *Pollen presenter* an oblique, obovate cochleariform disc. *Ovary* ovoid, 1–2 mm long, tomentose. *Hypogynous scales* 1–1.5 mm long, subulate to filiform, pale yellow. *Fruits* narrowly cylindric, 7 mm long, 1.5 mm in diam., truncate and broadly pedicellate at the base, thinly sericeous but hispid at the base.

Diagnosis: *S. racemosa* is distinguished by its small (1–3 cm long), lax, pedunculate inflorescences, the tridentate lower lip of the involucre, and the long, narrowly cylindric (7 mm long, 1 mm in diam.) fruits thinly sericeous with a hispid base.

In the appendix to the *Hortus Cliffortianus* there is a polynomial reading; “*Protea foliis setaceis floribus racemosis*”. In his “*Species Plantarum*” ed. 1 (1753), Linnaeus cites this under *Leucadendron racemosum*. Although the words “*flosculis disjunctis*” are substituted for “*floribus*” of the Hort. Cliff. diagnosis, it is reasonable to assume that the *Species Plantarum* diagnosis was based at least in part on the Hort. Cliff. specimen. Robert Brown realised the importance of this specimen but failed to trace it in the Banks collection at the British Museum remarking, “of *Protea racemosa* added in the appendix there is no specimen whatever” (Brown 1810). The specimen could still not be found when the author examined the Hortus Siccus Cliffortianus in June 1968. Bergius however, had no doubt as to the identity of *Leucadendron racemosum* L. He gives a very detailed description of this species, citing the first edition of the



Spartalla
ramulosa
Brown.

S. r. B. sp. n. 1844

S. r. B. sp. n. 1844

Spartalla ramulosa
Brown.

Spartalla ramulosa
Brown.
Spartalla ramulosa
Brown.

Species Plantarum. There is no difficulty in identifying Bergius's concept of this species from his descriptions (1766, 1767), and from the specimen in his herbarium. Later, in the *Mantissa Altera* (1771), Linnaeus transferred the epithet "racemosa" to *Protea*, omitting all references to his own works in which he had described this species and citing only Bergius (1767). It is known that Linnaeus visited Bergius during the period 1770—1771 when he was able to examine Bergius's herbarium and it seems that this visit may have had some bearing on Linnaeus's alteration to the synonymy of *Protea racemosa*. Thus, in view of Linnaeus's acceptance of Bergius's description by the time the *Mantissa Altera* had been published (probably as a result of having seen the specimen in herb. Bergius), it seems appropriate that the Bergius specimen should serve as the neotype of *Spatalla racemosa* (L.) Druce until such time as authentic, pre 1753 material of this species, which was seen by Linnaeus, comes to light.

I am indebted to Prof. T. Norlindh of Stockholm, Dr. W. T. Stearn of the British Museum (Natural History), and Prof. T. T. Barnard for their opinions on this matter.

The type of *S. laxa* R.Br. has been examined at the British Museum and is clearly conspecific with *S. racemosa* (L.) Druce. No type material of *S. ramulosa* R.Br. has been traced, but it is quite evident from Brown's description that he is referring to *S. racemosa*.

Type Material: E cap. b. spei, *Grubb*, in herb. Bergius (SBT), neotype.

Distribution: Apart from an isolated population on the east bank of the Steenbras reservoir, the main area of distribution extends from the Highlands Forest Reserve and Houw Hoek, southwards to Hermanus.

Ecology and Biology: This is a very common species locally and usually grows in scattered populations in open hilly country or on sandy flats. It shows a marked preference for south and east facing slopes in stony, well drained situations, always on acidic soils derived from Table Mountain sandstone. The flowering period extends from September to March.

Specimens Examined:

SOMERSET WEST: South east bank of Steenbras reservoir, Feb., *Rourke* 327 (NBG).

CALEDON: Highlands, Nov., *Compton* 12277 (PRE); Hermanus, Nov., *F. A. Rogers* 26416 (PRE); Viljoens Pass, Aug., *Rossouw* s.n. (STE 10977); Houw Hoek, July, *Levy* 11328 (CT); Highlands, Elgin, Nov., *Winkler* 13 (NBG); Honingklip, Bot River, Sept., *L. E. Taylor* 4072 (NBG); Villiers Dorp, Sept., *M. Cloete* s.n. (NBG 19199); Rotary Way

PLATE 10.

Spatalla racemosa (L.) Druce. The sheet in the Bergius Herbarium, Stockholm, labelled "e Cap. b. sp. *Grubb*" which has been chosen as the neotype of *S. racemosa*. The inscriptions which appear here at the base of the photograph, are on the back of the sheet.

Photo: by courtesy of Prof. T. Norlindh, Stockholm.

Hermanus, June, *Horrocks* 189 (NBG); Palmiet River, Nov., *Compton* 14107 (NBG); Hermanus road, Bot River, Sept., *Barker* 5877 (NBG); Houwhoeckberg, May, *H. C. Taylor* 4831 (PRE); Mountains near Palmiet River, April, *Stokoe* 419 (PRE); Hermanus mountains, Sept., *Gillet* 4425 (PRE); Houw Hoek, Sept., *Pappe* s.n. (SAM 19824); Shaws Moun-



Map 32. Distribution of *Spatalla racemosa* (L.) Druce.

tain, May, *Lewis* 3 (SAM); Highlands estate, Oct., *Lewis* 2600 (SAM); Paardeberg mts., March, *Stokoe* s.n. (SAM 62147); Kleinmond, Dec., *Stokoe* s.n. (SAM 65151); Palmiet River valley, Feb., *Stokoe* s.n. (SAM 56366); Hemel en Aarde, Dec., *Barker* 7607 (NBG); Plateau behind Hermanus, Oct., *Gillet* 975 (BOL); Houw Hoek, *F. Guthrie* 2517 (BOL); Bot River, Sept., *Compton* 21986 (BOL, NBG); Hills in Shaws mountain near Caledon, Oct., *Bolus* 9159 (BOL); Mountains above Preekstoel at Hermanus, Sept., *Williams* 889 (NBG); Plains east of Kleinmond, April, *Galpin* 12855 (PRE); Houw Hoek mountains, Oct., *Schlechter* 5465 (PRE, STE, SAM); Top of Shaws Pass, Dec., *Acocks and Hafstrom* 2119 (PRE); Hawston mountain, Dec., *Bond* 757 (NBG); Hottentots Holland; West of Steenbras reservoir, Dec., *Salter* 4220 (PRE); Highlands forest reserve, July, *Rourke* 487 (NBG); In the mountains near Houw Hoek, April, *Bolus* 5348 (BOL); Klein Hout Hoek, March, *Roxburgh* s.n. (BM); Kline Hout Hoek, March 1800, *Niven* 30 (K); "Klein Hout Hoek, in elevated places", *Niven* 16 (K); Caledon, Jan.—April 1827, *Jules Verreaux* (G); Houwhoek, Oct. 1907, *Phillips* 54 (G); Below "The Craggs", Kleinmond, July, *Rourke* 783 (NBG).

WITHOUT PRECISE LOCALITY: E. Cap. B. Spei, *Grubb*, in herb. Bergius (SBT); e Cap. B. Spei, *Thunberg*, sheet no. 2969 in herb. Thunberg (UPS); Without collector, in herb. Swartz (S); Cap. B. Spei, comm. *Thunberg* anno 1774, in herb. Montin (S); C.B.S., *Thunberg*, in herb. Alstroemer (S); Prom. B. Spei, *J. Roxburgh* (G); Without collector, in herb. Burman (G).

(20) *Spatalla mollis* R.Br. in Trans. Linn. Soc. Lond. **10** : 144 (1810).

Protea mollis (R.Br.) Poir. in Lam., Encycl. Meth. Bot. Supp. **4** : 577 (1816).

Spatalla brachyloba Phillips, in Kew Bull. **1910** : 333 (1910).

Spatalla pilosa Phillips, in Kew Bull. **1910** : 335 (1910).

An erect, rounded, much branched shrub, branching from near the base, to 0.75 m tall. Branches erect, slender, pilose when young becoming glabrous later, covered with densely imbricate leaves. Leaves acicular terete, bluntly mucronate, 15—20 mm long, sparsely pilose when young becoming glabrous. Inflorescence terminal, sessile to subsessile, cylindric, 3—4 cm long, 1 cm in diam. Bracts linear, furrowed on the upper surface at the base, terete at the apex, 2—4 mm long, thinly sericeous. Involucres one flowered, tightly clasping the flower, 2 mm long, consisting of three narrowly ovate bracteoles, the two anticus bracteoles being fused in their lower half to form the anticus lip. Involucres pedicellate, pedicel 1—2 mm long, thinly sericeous. Perianth 7—9 mm long, strongly curved forward in bud. Perianth segments unequal, the posticus segment erect, larger than the three anticus segments. Perianth claws narrow, villous. Perianth limbs elliptic, the posticus perianth limb galeate, more densely lanate than the three anticus limbs. Perianth tube glabrous, 2 mm long. Anthers elliptic, apical boss black, rounded or pointed. Style 5 mm long, straight, the lowermost third of the style sericeous, otherwise glabrous. Pollen presenter an oblique, obovate, cochleariform disc. Ovary ellipsoid, tomentose, 1 mm long. Hypogynous scales linear deltoid, 1 mm long. Fruits cylindric, obtuse at the apex, truncate and pedicellate at the base, 4 mm long, 1.5 mm in diam., hispid.

Diagnosis: A character unique in the genus, namely, the pubescence of the lower third of the style, distinguishes *S. mollis* from all other species of *Spatalla*. The bifid lower lip of the involucre is also a useful diagnostic character.

After Robert Brown had described *S. mollis* from material collected by J. Roxburgh, two further species, *S. pilosa* and *S. brachyloba* were described by Phillips. Iso-syntypes of both these species have been examined (in SAM and



Map 33. Distribution of *Spatalla mollis* R.Br.

PRE) and there can be no doubt that they are both synonymous with *S. mollis* R.Br.

Type material: The holotype is a sheet in the British Museum on which is mounted a number of specimens of this species and is marked "J. Roxburgh, Africa Australis". A photograph of the holotype is in the Bolus herbarium (BOL).

Distribution: *S. mollis* is confined to a rather small area in the Caledon district, mainly in the Kogelberg reserve; on the south eastern slopes of the Hottentots Holland mountains, in the Nieuweberg forest reserve, and on the Groenlandberg near Houwhoek.

Ecology and Biology: This species occurs in mountainous country at altitudes of over 1,500 ft., and is always found growing on or near the margins of streams, in black, peaty soil. It appears to be restricted to a region of high winter rainfall (40—75" p.a.). In almost all cases the plants are found growing together in small colonies. The flowering period commences in July and continues into December.

Specimens Examined:

CALEDON: Slopes N.W. of Steenbras reservoir, *Salter* 5125 (BOL); Mountain slopes between Gordons bay and Steenbras, Dec., *Lewis* 1642 (SAM); Hottentots Holland mts., July, *Stokoe* s.n. (PRE 29736); Hottentots Holland mts., Sir Lowrys pass, *MacOwan* 1762 (PRE, SAM); Plateberg and Paardeberg, near mouth of Palmiet river, Dec., *Stokoe* s.n. (PRE 29740); Gordons bay, Jan., *Marloth* 2854 (PRE); Palmiet river mts., Dec., *Stokoe* 938 (BOL); Paardeberg, above Kleinmond, Dec., *Rourke* 27 (BOL); Mts. near mouth of Palmiet river, May, *Stokoe* 8366 (BOL); Kogelberg, east foot, Jan., *Esterhuysen* 10014 (BOL); Paardeberg, March, *Vogts* 75 (STE); Kogelberg, Aug., *van der Merwe* 1228 (PRE, STE); Aries kraal, Dec., *Leighton* 904 (BOL); Palmiet river mts., Sept., *Levyns* 7794 (CT); Hottentots Holland, July, *Zeyher* 3720 (Partly) (SAM); Grabouw, Jan., *Stokoe* s.n. (SAM 56362); Palmiet river valley, May, *Stokoe* 56363 (SAM); Paardeberg, March, *Stokoe* s.n. (SAM 65150); Oudebosch, Dec., *Stokoe* s.n. (SAM 66202); Aries kraal, Jan., *Compton* 16856 (NBG); North of Elgin, Dec., *L. E. Taylor* 3887 (NBG); Nieuweberg, Aug., *Compton* 9221 (NBG); Paardeberg, Feb., *Grobler* 08113 (PRE); Hottentots Holland, 22 Sept. 1846 *Alexander Prior* (K); Nieuweberg Forest reserve, Aug., *Rourke* 826 (NBG); South East slopes of Groenlandberg, below Mt. Lebanon, Sept., *Rourke* 1104 (NBG).

WITHOUT PRECISE LOCALITY: Prom bona Spei, *Dr. Roxburgh* (G); Prom b. Spei *J. Roxburgh* (G); Africa australis, *J. Roxburgh* (BM).

SPECIES EXCLUDED

(1) *Sorocephalus dregei* Buek ex Meisn. in DC. Prodr. 14 : 305 (1856).

Sorocephalus intermedius Buek, in Drege Zwei Pfl. Docum. : 17, 222 (1843)—nom. nud.

Soranthe dregei (Buek ex Meisn.) O. Kuntze, Rev. Gen. Pl. 2 : 582 (1891).

This is *Leucadendron sorocephalodes* Phillips and Hutchinson in *Flora Capensis* 5 : 528 (1912), and is based on a collection from "Between Kliprivier and Avontuur", 2,500—3,500 ft., 13/11/1831, *Drège* 1489 (P).

- (2) *Sorocephalus diversifolius* R.Br. in Trans. Linn. Soc. Lond. **10** : 143 (1810).
Protea diversifolia (R.Br.) Poir. in Lam., Encycl. Meth. Bot. Suppl. **4** : 577 (1816).
Soranthé diversifolia (R.Br.) O. Kuntze, Rev. Gen. Pl. **2** : 582 (1891).
Nivenia diversifolia (R.Br.) Phill. and Hutch. in Fl. Cap. **5** (2) : 713 (1912).

This is *Paranomus diversifolius* (R.Br.) N.E.Br. in Trans. R. Soc. S. Afr. **21** : 261 (1933).

- (3) *Sorocephalus verticillatus* (Thunb.) Roem. and Schult., Syst. Veg. **3** : 391 (1818).

Protea verticillata Thunb. in Hoffm. Phytogr. Blatt. : 12 (1803).

Leucadendron verticillatum (Thunb.) Meisn. in DC. Prodr. **14** : 228 (1856).

This is *Leucadendron verticillatum* (Thunb.) Meisn (= *L. cinereum* R.Br. in Flora Capensis), and is based on sheet no. 2999 in herb. Thunb. (UPS).

REFERENCES

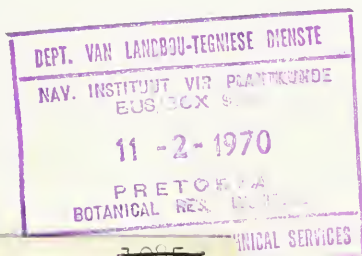
- AITON, W. 1810. Hortus Kewensis 2nd. ed. **1**: 203. London.
- ADAMSON, R. S., AND SALTER, T. M., 1950. Flora of the Cape Peninsula. Juta. Cape Town.
- BEARD, J. S. 1959. The origin of the African Proteaceae. *Jl S. Afr. Bot.* **25**: 231-235.
- BENTHAM, G. 1873. Notes on the styles of Australian Proteaceae. *J. Linn. Soc. Bot.* **13**: 58-64.
- BERGIUS, P. J. 1767. Descriptiones Plantarum ex Capite Bonae Spei. Stockholm.
- BRITTEN, J. 1866. On the nomenclature of some Proteaceae. *J. Bot., Lond.* **24**: 296-300.
- BRITTEN, J. 1920. Some early Cape botanists and collectors. *J. Linn. Soc. Lond.* **45**: 47.
- BROWN, R. 1810. On the Proteaceae of Jussieu. *Trans. Linn. Soc. Lond.* **10**: 15-226.
- DAHLGREN, R. 1963. Studies on *Aspalathus*, phytogeographical aspects. *Bot. Notiser.* **116**: 431-472.
- DAVIS, P. H. AND HEYWOOD, V. H. 1963. Principles of Angiosperm Taxonomy. Oliver & Boyd. Edinburgh.
- DU TOIT, A. L. 1966. Geology of South Africa. Ed. 3. Oliver & Boyd. Edinburgh.
- EAMES, A. J. 1961. Morphology of the Angiosperms. McGraw-Hill. New York.
- ENDLICHER, S. 1837. Genera Plantarum fasc. **5**: 338 (Dec. 1837).
- HABER, J. M. 1959. The comparative anatomy and morphology of the flowers and inflorescences of the Proteaceae. 1. Some Australian taxa. *Phytomorphology* **9**: 325-358.
- HABER, J. M. 1961. The comparative anatomy and morphology of the flowers and inflorescences of the Proteaceae. 2. Some American taxa. *Phytomorphology* **11**: 1-16.
- HABER, J. M. 1966. The comparative anatomy and morphology of the flowers and inflorescences of the Proteaceae. 3. Some African taxa. *Phytomorphology* **16**: 490-527.
- JOHNSON, L. A. S. AND BRIGGS, B. G. 1963. Evolution in the Proteaceae. *Aust. J. Bot.* **11**: 21-61.
- KNIGHT, J. 1809. On the cultivation of the plants belonging to the natural order Protéeae. London.
- LEVYNS, M. R. 1954. The genus *Muraltia*. *Jl S. Afr. Bot. Suppl.* vol. **2**.
- LOUDON, J. C. Encyclopedia of Plants: 83 (1829). London.
- PHILLIPS, E. P. 1912. A note on the principal systematic work and publications dealing with the South African Proteaceae. *Trans. R. Soc. S. Afr.* **11**: 275-282.
- STEARNS, W. T. 1966. Botanical Latin. Nelson. London.
- STEBBINS, G. L. 1951. Variation and evolution in plants. Columbia Univ. Press.
- SÖHNGE, P. G., VISSER, D. J. L. AND VAN RIET LOWE, C. 1937. The Geology and Archaeology of the Vaal river basin. *Geol. Surv. Mem.* **35**. Pretoria.
- VAN ZINDEREN BAKKER, E. M. 1962. Botanical evidence for Quaternary climates in Africa. *Ann. Cape Prov. Mus.* **2**: 16-31.
- WEIMARCK, H. 1941. Phytogeographic groups, centres and intervals within the Cape Flora. *Lund. Univ. Arsker.* **36**.

INDEX

The names of species upheld in this work are in bold type, synonyms and excluded taxa are in *italics*.

LEUCADENDRON	PAGE	SORANTHE—(Cont.)	PAGE
<i>cinereum</i> R.Br.	122	<i>scabridus</i> (Meisn.) O. Kuntze	44
<i>nervosum</i> Phill. & Hutch.	77	<i>setacea</i> (R.Br.) O. Kuntze	83
<i>racemosum</i> L.	114, 115	<i>tenuifolia</i> Salisb. ex Knight	53, 54
<i>sorocephalodes</i> Phill. & Hutch.	121		
<i>verticillatum</i> (Thunb.) Meisn.	122		
		SOROCEPHALUS	
NIVENIA		<i>alopercurus</i> Rourke	22, 24–27
<i>diversifolia</i> (R.Br.) Phill. & Hutch.	122	<i>clavigerus</i> (Salisb. ex Knight)	13, 22, 26–30
		Hutchinson	22, 40–44
PARANOMUS		<i>capitatus</i> Rourke	22, 33–36, 40
<i>diversifolius</i> (R.Br.) N.E.Br.	122	<i>crassifolius</i> Hutchinson	22, 33–36, 40
		<i>diversifolius</i> R.Br.	122
PHYLICA		<i>dregei</i> Buek ex Meisn.	121
<i>abietina</i> E.Mey.	94	<i>imberbis</i> R.Br.	23
		<i>imbricatus</i> (Thunb.) R.Br.	ii, 21, 22, 38–40
PROTEA		<i>intermedius</i> Buek	121
<i>australis</i> Poir.	62	<i>lanatus</i> (Thunb.) R.Br.	4, 11, 13, 15, 22, 46–53
<i>bracteolaris</i> Poir.	105	<i>longifolius</i> (Meisn.) Phillips	23
<i>caudata</i> Thunb.	62	<i>palustris</i> Rourke	22, 31–33
<i>diversifolia</i> (R.Br.) Poir.	122	<i>pinifolius</i> (Salisb. ex Knight)	22–24
<i>imbricata</i> Thunb.	38	Rourke	46, 47, 50
<i>incurva</i> Thunb.	70	<i>phylicoides</i> Meisn.	46, 47, 50
<i>lanata</i> Thunb.	46	<i>rupestris</i> (Salisb. ex Knight)	26
<i>laxa</i> (R.Br.) Poir.	115	Phillips	34, 35, 79
<i>mollis</i> (R.Br.) Poir.	119	<i>salsoloides</i> R.Br.	22, 44–46
<i>nivea</i> (R.Br.) Poir.	108	<i>scabridus</i> Meisn.	46, 47
<i>pedunculata</i> (R.Br.) Poir.	108	<i>schlechteri</i> Phillips	83
<i>polystachya</i> (R.Br.) Poir.	90	<i>setacea</i> R.Br.	68, 69
<i>prolifera</i> Thunb.	99	<i>spatalloides</i> R.Br.	9, 15, 22, 53–55
<i>pyramidalis</i> (R.Br.) Poir.	90	<i>teretifolius</i> (Meisn.) Phillips	22, 36, 37
<i>racemosa</i> L.	114, 115, 117	<i>tulbaghensis</i> Phillips	59
<i>salsoloides</i> (R.Br.) Poir.	79	<i>verticillatus</i> (Thunb.) Roem. & Schult.	122
<i>sericifolia</i> Poir.	94		
<i>tenuifolia</i> (R.Br.) Poir.	53		
<i>verticillata</i> Thunb.	122		
		SPATALLA	
SORANTHE		<i>argentea</i> Rourke	5, 8, 10, 74–77, 79
<i>clavigera</i> Salisb. ex Knight	26, 29	<i>barbigera</i> Salisb. ex Knight	5, 11, 13, 16, 94–96
<i>cliviciflora</i> Salisb. ex Knight	46	<i>bolusii</i> Phillips	90
<i>diversifolia</i> (R.Br.) O. Kuntze	122	<i>bombycina</i> Salisb. ex Knight	90
<i>dregei</i> (Buek ex Meisn.) O. Kuntze	121	<i>brachyloba</i> Phillips	119, 120
<i>glanduligera</i> Salisb. ex Knight	38	<i>bracteata</i> R.Br.	105, 106
<i>imbricata</i> (Thunb.) O. Kuntze	38	<i>brevifolia</i> Phillips	62, 63
<i>lanata</i> (Thunb.) O. Kuntze	46	<i>burchellii</i> Phillips	94
<i>montana</i> Salisb. ex Knight	26, 29	<i>caudaeiflora</i> Salisb. ex Knight	62
<i>pinifolia</i> Salisb. ex Knight	23	<i>caudata</i> (Thunb.) R.Br.	8, 62–65
<i>rupestris</i> Salisb. ex Knight	26, 29	<i>colorata</i> Meisn.	9, 16, 96–99
<i>salsoloides</i> (R.Br.) O. Kuntze	79		

SPATALLA—(Cont.)		PAGE	SPATALLA—(Cont.)		PAGE
confusa (Phillips) Rourke	8, 11, 18,	65–68	propinqua R.Br.	. . . . .	10, 77–79
curvifolia Salisb. ex Knight	11, 13, 15,	56, 108–114	polystachya R.Br.	. . . . .	90
<i>cylindrica</i> Phillips	. . . . .	105, 106	pyramidalis R.Br.	. . . . .	90
<i>ericaefolia</i> Salisb. ex Knight	. . . . .	62, 63	racemosa (L.) Druce	2, 10, 114–119	
ericoides Phillips	9, 16, 103–105		<i>ramulosa</i> R.Br.	. . . . .	115, 117
<i>galpinii</i> Phillips	. . . . .	108, 109	salsoloides (R.Br.) Rourke	8, 9, 34,	79–83
<i>gracilis</i> Salisb. ex Knight	. . . . .	114	<i>sericea</i> R.Br.	. . . . .	94
incurva (Thunb.) R.Br.	8, 10, 11, 13, 15,	56, 70–74, 79	setacea (R.Br.) Rourke	9, 80, 83–86	
<i>laxa</i> R.Br.	. . . . .	115, 117	squamata Meisn.	9, 16, 101–104	
longifolia Salisb. ex Knight	9, 80, 105–	109, 111	<i>thunbergii</i> R.Br.	. . . . .	62, 63
mollis R.Br.	11, 13, 16, 80, 119–121		thyrsiflora Salisb. ex Knight	8, 10,	68–70, 80
<i>mucronifolia</i> Phillips	. . . . .	71	tulbaghensis (Phillips) Rourke	8, 47,	59–61
<i>nana</i> Salisb. ex Knight	. . . . .	70	<i>wallichii</i> Phillips	. . . . .	71
<i>nivea</i> R.Br.	. . . . .	108, 109	SPATALLOPSIS		
nubicola Rourke	. . . . .	8, 86–89	<i>caudaeiflora</i> (Salisb. ex Knight)		
parilis Salisb. ex Knight	9, 11, 13, 16,	90–93, 111	Phillips	. . . . .	62
<i>pedunculata</i> R.Br.	. . . . .	108, 109	<i>caudata</i> (Thunb.) Phillips	. . . . .	62
<i>pitosa</i> Phillips	. . . . .	119, 120	confusa Phillips	. . . . .	65
<i>procera</i> Salisb. ex Knight	. . . . .	71	<i>ericaefolia</i> (Salisb. ex Knight)		
prolifera (Thunb.) Salisb. ex Knight	9, 54, 99–101		Phillips	. . . . .	62
			<i>propinqua</i> (R.Br.) Phillips	. . . . .	77
			<i>begleyi</i> Phillips	. . . . .	83, 84



582.639.2

ROURKE, J.

Taxonomic studeis on
Sofoccephalus...

Datum
geleen.
Date bor-
rowed.

Handte
Bor

6-9-73

8/5

2

582.639.2

1085

